International Edition

January 1984 $2.50
Issue #280

# 73

# Amateur Radio's Technical Journal

A Wayne Green Publication

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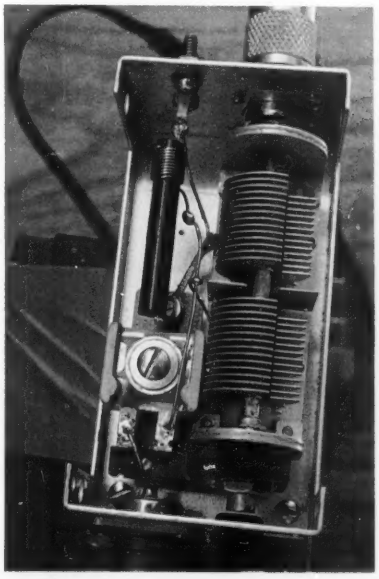

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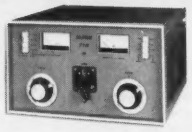

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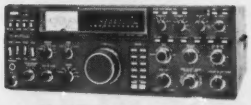

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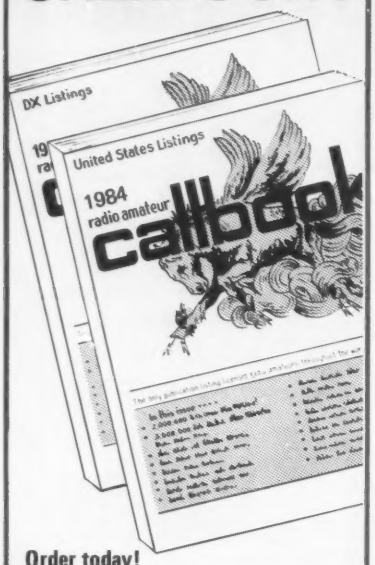


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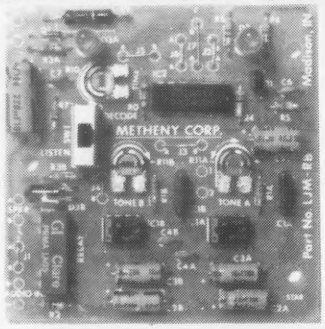


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*73: Amateur Radio's Technical Journal* (ISSN 0745-080X) is published monthly by Wayne Green, Inc., 80 Pine Street, Peterborough NH 03458. Second class postage paid at Peterborough NH 03458 and at additional mailing offices.


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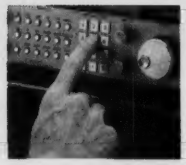

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# W2NSD/1
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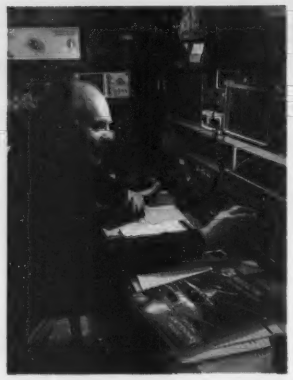
*editorial by Wayne Green*



### WELL, 1984 IS HERE

It hasn't turned out much like Orwell's book, thankfully. Actually, these should be great days for hams. After all, here we are right in the early stages of the electronic revolution—something amateur radio helped in a great measure to get started. The revolution has taken some twists, so only those hams with a flexible attitude have managed to keep up with what is going on.

Indeed, I find that I have to spend a good deal of my time just trying to keep up with the onrush of technology. This means talking with people, reading several hundred technical magazines a month as well as a few books, and getting to shows—a lot of shows. They are worthwhile for me because I can see the gear, ask questions, and learn more in a short time.

Okay, you may want to know what the bottom line is of all this activity on my part. I'll tell you...take it easy. First, as far as amateur radio goes, you may suspect that all is not well. This is heyday time for the gloom and doomers, with ARRL membership dropping like a brick, more and more dealers going bankrupt, more of our American manufacturers becoming invisible, and the sunspots diminishing.

I prefer to look on the bright side. Here we have a new OSCAR up there begging for use. We have several new modes of communication begging for activity such as packet radio, crossband repeaters, on-the-air bulletin boards—stuff like that. With low-cost computers and chips, experimenters have never had it so good. We can build circuits in an evening that would have filled several relay racks a few years ago—so let's have at it. You build 'em and I'll publish 'em—okay?

You might like to know that we're seeing some progress with some of my other ideas. I'd like to prove what can be done in high-powered education—turning out high-tech kids with a strong business education. If you think about it, you'll realize that this would be a way to give them a super start in a career. And there is some progress with my idea for getting ham clubs started in every high school in the country. Despite the obvious need for technical people, I've run into more resistance with this idea than I expected.

Now, in case you're interested in an overview of tech-

*Continued on page 116*

### HELP WANTED

*73* is currently seeking a TECHNICAL/INTERNATIONAL EDITOR. The position requires excellent written and oral communications skills, as well as a General-class or higher ticket. Experience with microcomputers would be a help. Responsibilities include participating in manuscript review, organizing and implementing special projects, and supervising our staff of foreign correspondents.

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### QSL OF THE MONTH

This month's flashy winner, submitted by Jim Houston ZS6BUR, surely brightens up ham-shack walls around the world.

To enter your QSL card in *73*'s QSL of the Month contest, put it in an envelope with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be eligible.


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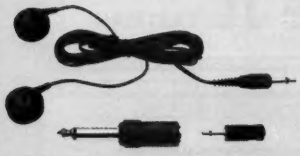
## MC-85

**Multi-Function Desk Top Microphone (8-pin)**

700 Ω Uni-directional Electret Condenser Mic. Built-in mic-amp with output and tone control, meter, XCVR selector and UP/DOWN switch. Optional mic cables: PG-4D (4-pin), PG-4E (6-pin) & PG-4F (8-pin).



## HS-7

**Micro Headphones (16 Ω)**

Ultra light weight and portable ear-fitting headphones supplied with two audio adaptor plugs.

## DM-81

**700 kHz-250 MHz Dip Meter**

All solid-state and built-in battery.

## MC-80

**Desk Top UP/DOWN Microphone (8-pin)**

700 Ω Uni-directional Electret Condenser Mic. with "FLEX" type boom. Built-in mic-amp and UP/DOWN switch. Optional mic plug adaptors: MJ-84 (8p-4p) & MJ-86 (8p-6p).

## SP-50

**High Quality External Mobile Speaker**

## TL-922A

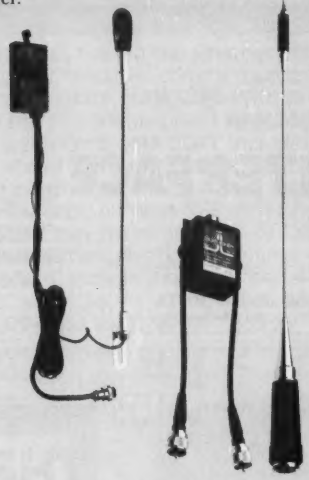
**160~15-m 2 KW PEP/1 KW DC Input Linear Amplifier**

Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

## MC-55 (8P/6P)

**Mobile Microphone (8-pin or 6-pin)**

700 Ω Electret Condenser Mic. with flexible boom, and separate STAND-BY box built-in UP/DOWN switch and 5 minute Time-Out-Timer.



## MA-4000

**2-m/70-cm Dual Band Mobile Antenna**

5/8 λ for 2-m and stacked 5/8 λ for 70-cm. Duplexer is supplied.

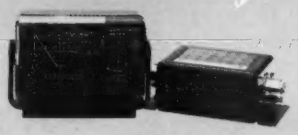
## PC-1A

**Phone Patch** (FCC Part 68 registered)

## SM-220

**Station Monitor/High-Performance Oscilloscope**

Pan-display capability with optional BS-8 (for TS-830S/820S/180S) or BS-5 (for TS-520 series). Transmitted waveforms and/or receiving signal waveform monitor. Built-in 2-tone generator.



## SW-100A/B

**A: 160-m ~ 2-m. B: 2-m ~ 70-cm. 150 W SWR/POWER/VOLT Meter**

Compact design with separate coupler, ideal for mobile use. Built-in 0-20 V voltmeter.

**MICROPHONES:**

- **MC-60A** Deluxe desk top microphone with UP/DOWN switch. (8-pin) Pre-amplifier. 500/900 Ω
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included). (4-pin) 50 k/500 Ω
- **MC-50** Desk top microphone, 50 k/500 Ω (4-pin)
- **MC-48** 16-key autopatch UP/DOWN microphone. (8-pin)
- **MC-46** 16-key autopatch UP/DOWN microphone. (6-pin)
- **MC-42S** Hand microphone with UP/DOWN switch. (8-pin)
- **MC-35S** Noise-cancelling hand microphone, 50 k Ω (4-pin)
- **MC-30S** Noise-cancelling hand microphone, 500 Ω (4-pin)

**MICROPHONE CABLES:**

- **PG-4A/4B/4C** For MC-60A/60N4. PG-4A(4-pin)/4B(6-pin)/4C(8-pin)
- **PG-4D/4E/4F** For MC-85. PG-4D (4-pin)/4E(6-pin)/4F(8-pin)

**MICROPHONE PLUG ADAPTORS:**

- **MJ-48** (4-pin mic to 8-pin XCVR)
- **MJ-84** (8-pin to 4-pin)
- **MJ-86** (8-pin to 6-pin)

**HEADPHONES:**

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**GENERAL PURPOSE AC POWER SUPPLIES:**

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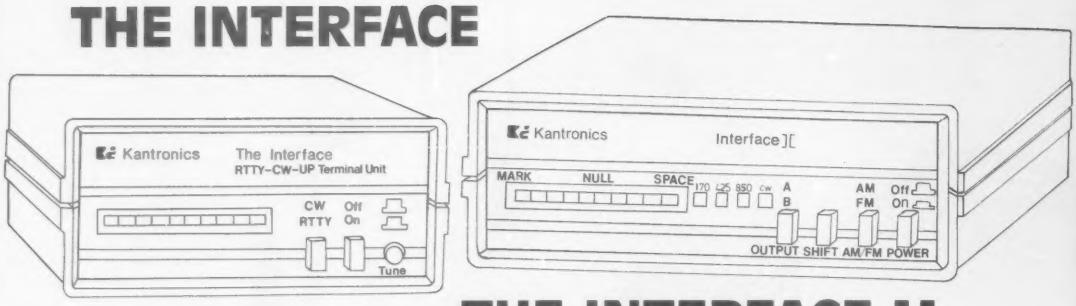


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WITH LOTS OF SUN. . .XYL SAYS
TIME FOR DINNER SO 73'S WØXI

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# Breakthrough in Boston: The Birth of Crosslinking

*W1UKZ built this box. It's small and it works. The question is whether you're ready for it.*

*David P. Allen W1UKZ*
*19 Damon Road*
*Scituate MA 02066*

A sage once said that a new idea is simply a rearrangement of old facts. This is certainly the case with crosslinking: All of the ingredients are well known and no new technology is involved. But the effect of putting them all together in a new operating mode has proven to be extraordinarily exciting to all who have participated. Let me explain just what crosslinking is.

Fig. 1 shows diagrammatically how crosslinking works. The basic idea is for an individual amateur to configure his low-band and two-meter rigs so that three operating conditions can be maintained:

1) When the amateur keys his microphone, he transmits simultaneously on *both* a low-band frequency and a two-meter frequency. One microphone keys both rigs.

2) When the amateur *listens*, he pushes a button which feeds the audio output of whichever band he is momentarily listening to into the microphone input of the other transmitter and keys that transmitter.

3) When listening to a station on the other band, he pushes a button and reverses that process. He may interrupt this back-and-forth flow at any time simply by keying his microphone.

If this all sounds like a manually-operated repeater, you are *almost* right; however, there are some very important differences. A little background will help to explain how this new operating technique emerged.

**Background**

For the past five years, I have had the pleasure of conducting the East Coast Apple Net on forty meters. Every Saturday morning we gather at 9 am eastern time on 7260 kHz to chat about computers in general and Apple computers in particular. This has proven to be a very popluar net since so many hams are also computer enthusiasts. Because of the general popularity of computers, I have known for a long time that we have a "lurking," voiceless audience of people who have an abiding computer interest but no amateur license. There are also many licensed amateurs who do not have low-band privileges.

"Why not," thought I, "conduct the net on *both* 40

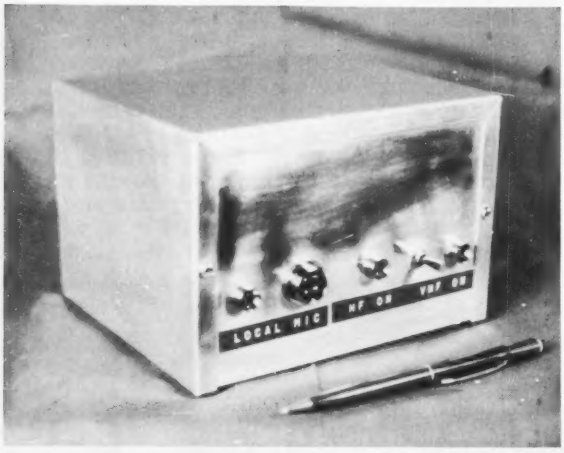


*Photo A. Front view of the logic box.*

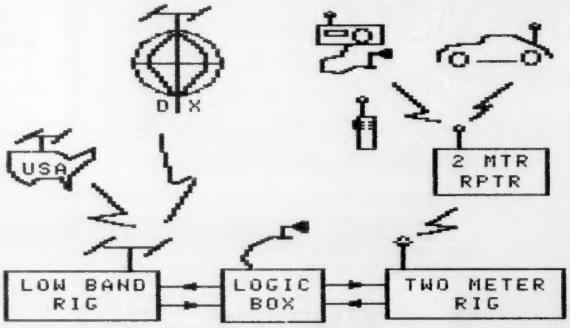


*Fig. 1. Diagram of how crosslinking works.*

meters and 2 meters and thereby enable a wider participation in the net?" There did not seem to be any technical reason standing in the way of this evolution. Crossband operating is as old as amateur radio itself, and I had all the hardware (almost) necessary to try it. Just one experiment with holding microphone to loudspeaker showed two things: (1) It had great possibilities, and (2) a missing black box was needed to make it work properly.

That was the generating force for the "logic box," shown in Fig. 2. More about that later. There was another consideration which might offer a much greater handicap to carrying out this idea. It's called "FCC rules and regulations." Amateur Extra class licensees would have no problem with any conceivable permutation of operating frequencies, but how about lower-class licensees? If it were illegal for a Technician to join the net on two meters and have his voice heard on forty meters, then I was just spinning my wheels with further conjecture on this idea. It obviously was time to go to the horse's mouth.

Conversation with the administrators of amateur operations at the FCC in Washington completely dissolved any apprehensions I had about the proposed operating procedure. All amateur participants would be licensed for the frequencies upon which they were transmitting and over which they had control. All conversation relayed by my facilities was clearly covered in the definition of what I was licensed to transmit. I was not proposing a repeater-type operation, which would be both illegal on the low bands and which would allow lower-grade licensees to control emissions on frequencies for which they were not licensed. Surprise, surprise! No bureacratic ground-breaking was involved! I was, in fact, sent on my way with an encouraging endorsement for trying out a new operating technique. Who says the bureaucracy is never administered with good judgment and understanding!

So, the decks were cleared for action. But there was still the problem of how to oversee the net and to control the flow of transmissions. The three points defined above seemed to describe all the elements of the technique that I was looking for. I wanted to be able to switch the audio to flow in either direction from one band to another at any time. I felt that a little momentary toggle switch would allow me to perform that function best. And I wanted to be able to break into the transmission pattern at any time with my voice, so my microphone switch should override whatever mode was going on. One other corollary mode comes about from pushing the mike button. When I finish talking, *both* rigs default to the listening mode so that I can monitor both bands at any time.

**Hardware**

The circuit necessary to control both rigs turned out to be a little more complicated than I had thought. Fig. 2 shows the result, which I have called the logic box. Three relays are involved, one for each band control plus a third relay for my microphone keying and to provide latching for the other two relays. Since the logic of the operating called for a momentary switch closure to *open* rather than close the ground circuit of the latched-up relays (a logic negative), I inserted a simple transistor switch to invert the mechanical switch logic. Thus, either latched-up relay RY1 or RY2 can be dropped by operating the transistor switch through SX1 or by removing the latching voltage by closing the push-to-talk switch on the microphone and dropping RY3.

*Photo B. Rear view of the logic box.*

The LEDs were put in to remind me of my last official act and clearly remind me of what the current transmission flow was. Relays were used because the widespread variation of keying methods for the current crop of transceivers is enormous. Varying polarities and voltages are made totally irrelevant by the good old relay. I can use the logic box with any transceiver I can lay my hands on.

Photos A and B show the front and back of the logic box. The inside is a typical prototype mess (so I won't let you in), but it all works exactly as planned. I decided to use the "standard" four-pin microphone connector used by so many transceiver manufacturers and readily available at Radio Shack. The speaker audio is bridged from the transceiver at the auxiliary audio-output jack and fed into the logic box through the mini-jack connector. Power for the relays is provided by any 9–12-volt calculator-type power supply that can furnish on the order of 200 milliamperes.

I was concerned about the varying levels of audio among the microphone and loudspeaker outputs. This turned out to be a reasonable concern. My first attempt was just to "brute-force" the audio through and see what happened. It worked, but not well. Here's what I had to do.

No ordinary microphone seems to be up to the task of feeding two rigs at once. The main problem is the widely varying input impedances of various transceivers plus the generally low output of most microphones. The solution for me was an amplified Astatic D-104 microphone. The power amplifier in this microphone turns the mike signal into a relatively

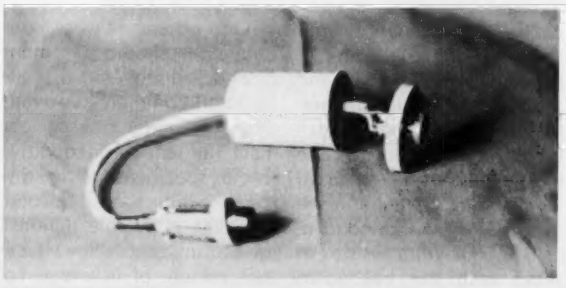

*Photo C. The mini-jack connector.*

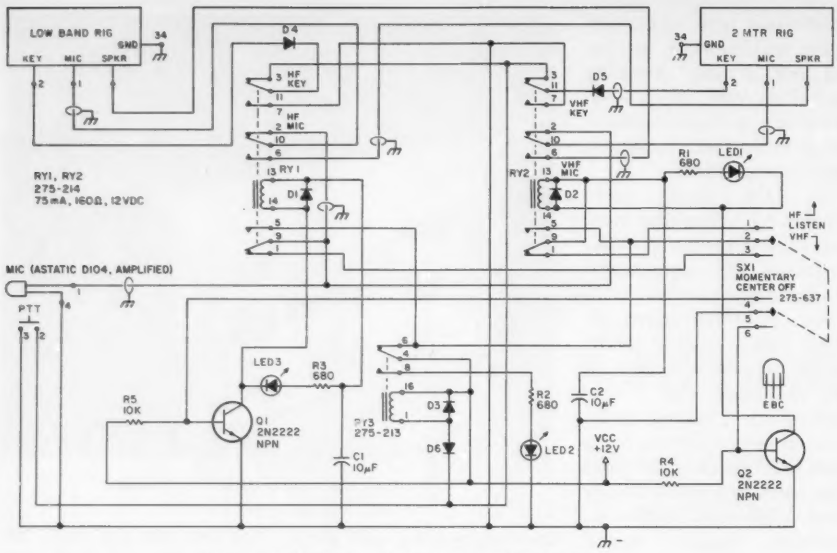


*Fig. 2. Schematic of the W1UKZ logic box.*

low-impedance output with some power behind it. Since the impedance of the microphone amplifier is lower than *either* transceiver mike-input impedance, there is plenty of audio available for each. Most two-meter transceivers have very efficient agc circuits in their mike-input circuits so I did not have to monitor that signal input. The low-band rig I am using (an Atlas 210X) gives me meter monitoring of the audio input and a gain control to manually adjust it.

Experience proved that the audio levels needed just a little more balancing. I wanted to be able to set the loudspeaker levels for each rig for comfortable listening and to have that be about right for the mike inputs. In my case, this meant padding down the audio from the transceivers rather heavily. I cobbled up some loss-pad cables, consisting of my standard four-pin microphone connectors and mounting the male end, normally living as a chassis-mount configuration, on the plastic cap of a discarded 35mm film container. (See Photo C.) Inside the container is a 560k-Ohm resistor in series with the hot audio lead, providing the necessary padding. Holes for the cable and connector take about ten seconds to make with a Princess soldering iron! Of course, I could easily have inserted the padding resistors inside the logic box, but this would have limited the universal nature of coupling the box to my rig configuration. For me, putting the pads in their own junction cables was best.

One other hardware consideration doesn't appear on the diagram. My next box will have a simple switch to disable the keying lead to either rig. This will make it unnecessary to disconnect the 2-meter input when I want to key only the low-band rig. Since I am using SSB on low bands, switching off the signal to the low-band rig is as simple as turning down the mike gain control. That facility is not available on two-meter transceivers.

One other hardware consideration should be mentioned. I discovered that almost *all* commercially-available two-meter transceivers have an unpublished duty-cycle specification. In my case, with the Kenwood TR-7800, it is three minutes of transmitting followed by one minute of listening. To transgress on that specification is to run your rig *very hot*—hot enough to do damage to the final transistor stage. This is true even at low-power options. In crosslink operations, transmissions longer than three minutes are commonplace, so a fan was in order. A cooling fan directed at the heat sink of the two-meter rig totally solved this problem. All those RTTY enthusiasts should note this potential problem since two-meter RTTY operating will certainly run into the same condition.

### Operating Experience

So, how does it work? On the net operations it was an instant success. The net immediately acquired a handful of stations not previously heard from. In addition, many comments from other hams who, although not inclined to join the net by announcing their presence, found it very convenient to be able to go about their Saturday morning chores while carrying around a handie-talkie to monitor the proceedings of the net. Of course if they were so inclined, they could break in at any point to make their comments heard.

The real excitement for this operating mode has come from an unexpected direction. Since I had the capability, I decided to explore the advantage of crosslinking for less formal purposes than net operation. Instant success!

The procedure used has been to find an under-used repeater and call "CQ DX." Of course, this conventional invitation goes out over both the low-band and two-meter frequencies. Some puzzlement is expressed by two-meter listeners who hear "CQ DX 20" and suspect the contents of my coffee cup. An understanding quickly ensues, however, and before you know it, there is a round table under way on the two-meter repeater involving one or more DX stations. The excitement generated by this technique was wholly unexpected.

The first comments came with wild enthusiasm from Technicians who suddenly found themselves able to experience the pleasure of DX operations for the first time. With this occasional taste of upgrading experience, they proceed with redoubled enthusiasm on the path of license upgrading. But General, Advanced, and Extra class licensees have been equally vociferous in their endorsements. As explained to me, there is something really neat in being able to walk on the beach with a handie-talkie and chat with a Russian amateur near Moscow! The two-meter mobilers, on the way home through dismal traffic conditions, also are excited about working on their DXCC while engaged in stop-and-go traffic.

And the DX stations! Well, they stand in line just waiting for an opportunity to join the crosslink. Operationally, I have tried to encourage more than one DX station at a time, if the DX stations can hear each other, so that the benefits of two-meter round-table conversation may be employed.

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**Parts List**

| Quantity | Item | Description | Radio Shack # |
|---|---|---|---|
| 2 | RY1, RY2 | 4PDT relay, 12 V dc | 275-214 |
| 1 | RY3 | SPDT relay, 12 V dc | 275-243 |
| 2 | Q1, Q2 | NPN transistor | 276-1617 |
| 1 | SX1 | DPDT switch, mom. | 275-637 |
| 3 | LED1, 2, 3 | Indicating LEDs | |
| 3 | R1, R2, R3 | 680-Ohm resistor, 1/4 W | |
| 2 | R4, R5 | 10k-Ohm resistor, 1/4 W | |
| 2 | C1, C2 | 10-uF, 15-WV capacitor | |
| 3 | | Microphone socket | 274-002 |
| 2 | | Microphone plug | 274-001 |
| 3 | D1, D2, D3 | Diode | 276-1620 |
| 1 | | 16-pin DIP socket (for RY3) | |
| 2 | Socket, RY1, 2 | Relay socket | 275-221 |
| 1 | | 12-V-dc power supply | 273-1652 |
| 1 | | Power-supply jack | 274-1549 |
| 2 | | Audio jack, 1/8" | 274-253 |

A typical drive-time round table recently found stations in Northern Ireland, England, Holland, Italy, Corsica, and Central Nigeria in a round table with five or six two-meter mobile stations on their way home from work! Another time found a one-Watt mobile station in Portsmouth, New Hampshire, talking with a station (ON0) in the Aland Islands off the coast of Finland. His route was via a two-meter repeater in New Hampshire to my station on the south shore area in Boston, over to Europe. Not bad for one Watt!

The permutations of this technique are probably already cycling through your mind. The band combinations obviously are not limited between just 20 meters and two meters. And ragchews don't have to involve only DX stations. How many different ways can *you* think of which might have lots and lots of good amateur radio fun involved, while at the same time challenging us to develop new hardware and operating techniques? How about different operating modes from just voice transmissions? A mixture, maybe...

**New Techniques and Considerations**

Here are some things I have learned already and some things that are as yet unresolved:

- Two-meter and DX-band operating procedures differ markedly. Two-meter operators use a speech-shorthand technique which needs modification when DX stations, some with limited English capability (and with some QRM and QSB problems thrown in), get added to the two-meter round table. DX stations seem very, very interested in the everyday experiences commonly discussed on two meters but rarely mentioned in DX conversations. Two-meter operators need to be clear in identifying their stations, using phonetics for their callsigns when necessary.
- Depending upon the skill of the operator at the host crosslinking station, rapid conversational gambits, common to two meters, can be employed. I think this type of exchange should be encouraged, but time will tell.
- Crosslink operators must be very careful not to allow transmission by unlicensed persons to enter the crosslink when stations in countries not supporting third-party traffic are involved. Since this is a brand new operating world for many Technician licensees, they are often unlikely to remember third-party proscriptions.
- All crosslink operators should keep very complete logs. This is not required by any FCC rule or regulation; it is simply to be able to reconstruct what went on for purposes of QSLing and other record keeping. How the rest of the world views the establishment of DX records for recognized purposes is yet to be established. At least one ham has started his own path toward DXCC via crosslinking.
- Amazingly enough, this technique both serves to conserve frequencies on the crowded low bands and provides new opportunities to develop greater employment of lesser-used bands, such as six meters. Clearly, six DX stations and six two-meter stations employing only one low-band frequency and two two-meter frequencies is band conservation. If the VHF frequency were on six meters, then the other part of the new equation would also be true.
- All is not just sweetness and light when new operating conditions appear. Those stations who like two-meter-repeater operation the way it is may object strenuously to a new idea which invades their otherwise untrammeled domain. Crosslink operators can expect to be invited off some repeaters. Crosslinking *can* use up a lot of repeater time, and those areas where repeaters are in short supply can anticipate even greater discussion about how repeaters should be employed. Maybe repeaters will need to be established primarily for crosslinking. Crosslinking on direct VHF frequencies needs to be developed.
- In the same vein, the cordial atmosphere which normally exists on repeaters during drive time needs to be conserved. When a crosslinking control station connects with a low-band station who wishes to crosslink, what happens? If there are stations on the repeater waiting to chat, all well and good. But suppose that two-meter connections have not yet been established? What then? The crosslink control station needs to assess carefully how courteously to enter a two-meter repeater with a DX station tagging along. Sometimes, two-meter stations just don't want "foreign" stations to enter their discussions and are not prepared to modify their technique to accommodate language and listening difficulties. How to establish a new operating protocol for this new ham radio technique needs to be discussed.

Crosslinking, I suspect, may become one of the most exciting operating techniques to be adopted since the entrance of single sideband. It comes with great opportunities and a variety of operating procedures yet to be developed. It does *not* require *any* new hardware developments. *You* can begin crosslinking as soon as you return from your local Radio Shack store with less than $20 worth of parts. If that doesn't make this idea pretty exciting, I don't know what will! ■

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The TR-720 contains the latest microprocessing technology which is responsible for its amazing size (6.6" x 2.6" x 1.5") and weight (1.2 lb.). Features include 3 memory channels, 720 COM and 200 NAV channel operation, twist-off rechargeable battery pack, and multi-function LED to indicate receive signal or low battery. A full set of standard accessories including rechargeable battery, AC and DC chargers, case, flex antenna, and earphone put you straight on the air. Optional accessories are available.

The TR-720 increases the operating safety of balloons, sailplanes, and ultralights by providing communication with ground crews or ATC. It allows receipt of IFR clearances prior to engine start and is indispensible for search and rescue, forest fire fighting, or law enforcement to coordinate aircraft operations. Sport aircraft, homebuilts, or experimental planes (even those without electrical systems) can now have reliable 720 channel communication. But perhaps the best advantage is the peace of mind that comes from having an emergency back-up transceiver.

The TR-720 comes with a full 1 year warranty with guaranteed 72 hour turnaround and is available for immediate delivery factory direct or from your local Avionics Dealer or FBO.

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# MFJ ACCESSORIES

## 300 WATT ANTENNA TUNER HAS SWR/WATTMETER, ANTENNA SWITCH, BALUN. MATCHES EVERYTHING FROM 1.8 to 30 MHz.

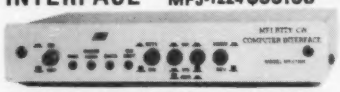
**$99.95** MFJ-941D

*NEW FEATURES*

**MFJ's fastest selling tuner packs in plenty of new features!**

- **New Styling!** Brushed aluminum front. All metal cabinet.
- **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.
- **New Antenna Switch!** Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.
- **New airwound inductor!** Larger more efficient 12 position air-wound inductor gives lower losses and more watts out. Run up to 300 watts RF power output. Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines. Built-in 4:1 balun for balanced lines. 1000V capacitor spacing. Black. 11x3x7 inches. Works with all solid state or tube rigs. Easy to use, anywhere.

## RTTY/ASCII/CW COMPUTER INTERFACE MFJ-1224 $99.95



**Send and receive computerized RTTY/ASCII/CW with nearly any personal computer** (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/Reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

## RX NOISE BRIDGE

**Maximize your antenna performance!** **$59.95** MFJ-202B Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

**New Features:** individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

## INDOOR TUNED ACTIVE ANTENNA

**"World Grabber" rivals or exceeds reception of outside long wires!** Unique **tuned** Active Antenna minimizes intermod, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

**$79.95** MFJ-1020

## POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

**Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner!** **$39.95** MFJ-313

144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

## MFJ/BENCHER KEYER COMBO

MFJ-422 **$99.95**

**The best of all CW worlds-** a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044 IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

## VHF SWR/WATTMETER

MFJ-812 **$29.95**

**Low cost VHF SWR/Wattmeter!** Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

## 1 KW DUMMY LOAD

MFJ-250 **$34.95**

**Tune up fast, extend life of finals, reduce QRM!** Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

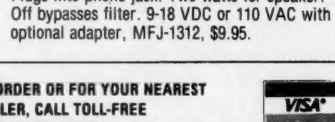
## 24/12 HOUR CLOCK/ID TIMER

MFJ-103 **$34.95**

**Switch to 24 hour GMT or 12 hour format!** Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Switchable seconds readout. Elapsed timer. Just start clock from zero and note time of event up to 24 hours. Bright blue .6" digits. Alarm with snooze function. Synchronizable with WWV. Lock function prevents mis-setting. Power out, alarm on indicators. Black. 5x2x3 in. 110 VAC, 60 Hz.

## DUAL TUNABLE SSB/CW FILTER

MFJ-752B **$89.95**



**Dual filters give unmatched performance!** The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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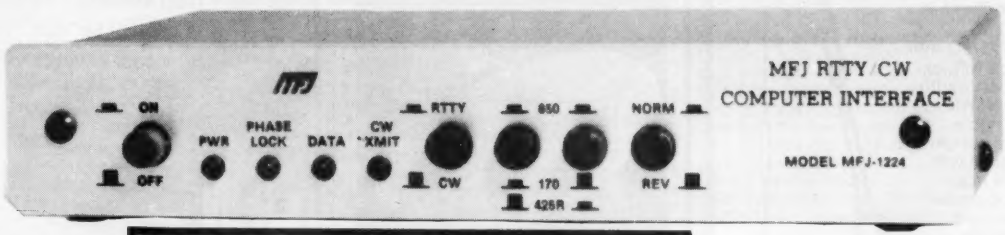
# MFJ RTTY / ASCII / CW COMPUTER INTERFACE

**Lets you send and receive computerized RTTY/ASCII/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 Pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses MFJ, Kantronics software and most other RTTY/CW software.**




**NEW!**

**MFJ Software plus MFJ Interface**
**for VIC-20 or Commodore 64**
(Software cartridge alone, $49.95. Order MFJ-1250 for VIC-20. MFJ-1251 for Commodore 64)
**$129.95**

***Powerful RTTY/ASCII/CW software for VIC-20, Commodore 64. Developed by MFJ. Cartridge plugs into expansion port. Features split screen display, type ahead buffer, message ports, RTTY/ASCII/CW send and receive plus much more.***
**Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64.**

**$99.95**
**MFJ-1224**

**This new MFJ-1224 RTTY/ASCII/CW Computer Interface** lets you use your personal computer as a computerized full featured RTTY/ASCII/CW station for sending and receiving.

**It plugs** between your rig and your VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, and most other personal computers.

**Powerful MFJ software available** for VIC-20 (MFJ-1250, $49.95) and Commodore 64 (MFJ-1251, $49.95). Features split screen display, type ahead buffer, message ports, RTTY/ASCII/CW send and receive plus more.

**Uses Kantronics software** for Apple, TRS-80C, Atari, TI-99 as well as VIC-20 and Commodore 64.

**You can also use most other RTTY/CW software** with nearly any personal computer.

**A 2 LED tuning indicator system** makes tuning fast, easy and positive. You can distinguish between RTTY/CW without even hearing it.

**Once tuned in,** the interface allows you to copy any shift (170, 425, 850 Hz and all shifts between and beyond) and any speed (5 to 100 WPM on RTTY/CW and up to 300 baud on ASCII).

**Copies on both mark and space,** not mark only or space only. This greatly improves copy under adverse conditions.

**A sharp 8 pole active filter** for 170 Hz shift and CW allows good copy under crowded, fading and weak signal conditions.

**An automatic noise limiter** helps suppress static crashes for better copy.

**A Normal/Reverse switch eliminates retuning** while stepping thru various RTTY speeds and shifts.

**The demodulator** will even maintain copy on a slightly drifting signal.

**A +250 VDC loop output** is available to drive your RTTY machine. Has convenient speaker output jack.

**Phase continuous AFSK transmitter tones** are generated by a clean, stable Exar 2206 function generator. Standard space tones of 2125 Hz and mark tones of 2295 and 2975 Hz are generated. A set of microphone lines is provided for AFSK out, AFSK ground, PTT out and PTT ground.

**FSK keying** is provided for transceivers with FSK.

**High voltage grid block and direct outputs** are provided for CW keying of your transmitter. A CW transmit LED provides visual indication of CW transmission. There is also an external hand key or electronic keyer input jack.

**In addition** to the Kantronics compatible socket, an exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. The following TTL compatible lines are available: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

**For example,** you can use Galfo software with Apple computers, RAK software with VIC-20's, or Clay Abrams software with TRS-80C, N4EU software with TRS-80 III, IV. Some computers with some software may require some external components.

**DC voltages** are IC regulated to provide stable AFSK tones and RTTY/ASCII/CW reception.

**Aluminum cabinet.** Brushed aluminum front panel. 8x1¼x6 inches. Uses 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

**MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.**

## RTTY/ASCII/CW Receive Only SWL Computer Interface

**$69.95**
**MFJ-1225**

Use your personal computer to receive commercial, military and amateur RTTY/ASCII/CW traffic.

The MFJ-1225 automatically copies all shifts (850, 425, 170 Hz shift and all others) and all speeds.

It plugs between your receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.

Use MFJ-1250 ($49.95) software cartridge for VIC-20 or MFJ-1251 ($49.95) software cartridge for Commodore 64. Use Kantronics software for Apple, TRS-80C, Atari and TI-99.

An automatic noise limiter helps suppress static crashes for better copy, while a simple 2 LED tuning indicator system makes tuning fast, easy and positive.

In addition to the Kantronics compatible socket, a general purpose socket provides RTTY out, RTTY inverted out, CW out, CW inverted out, ground and +5VDC for interfacing to nearly any personal computer with most appropriate software.

Audio in, speaker out jacks. 4½x1¼x4¼ in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

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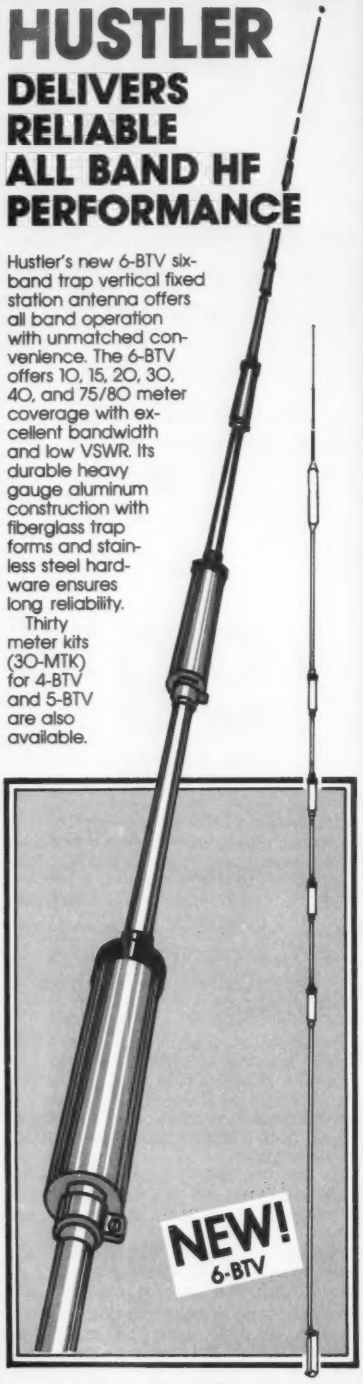
Hustler's new 6-BTV six-band trap vertical fixed station antenna offers all band operation with unmatched convenience. The 6-BTV offers 10, 15, 20, 30, 40, and 75/80 meter coverage with excellent bandwidth and low VSWR. Its durable heavy gauge aluminum construction with fiberglass trap forms and stainless steel hardware ensures long reliability.

Thirty meter kits (30-MTK) for 4-BTV and 5-BTV are also available.

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**IF YOU HAVEN'T HEARD OUR BEEPERS YOU'RE NOT LISTENING!**

What's a BEEPER? Sometimes called a "courtesy beep," both Faxscan BEEPERS add a gentle high frequency beep automatically to the beginning of each transmission and a low beep at the end. "Talk-over" is a thing of the past!

INTRODUCING BP-4 "The PRO" BEEPER. The PRO is state-of-the-art beeping! Includes a digitally-programmable timer (use it for ID or timeput warnings), an automatic "Slumber Mode" for long battery life (9V battery required—not included), and programmable volume control of the unique double 4-beep timeout warning. No speaker! Uses a piezo-transducer!

Hook-up's a snap with either model! Interfaces to virtually all modern gear. Manual supplied with each BEEPER. Available in three versions:

"A" versions are complete with case, cable, industry-standard 4-pin connectors

"B" versions are the same as above but without connectors. Add your own!

"C" versions are circuit-board models for custom installations. Perfect for repeaters or building INTO your rig

**BEEPERS ARE A FAXSCAN EXCLUSIVE!**

| BP-4 "The PRO" BEEPER | | BP-3 "The Original" BEEPER |
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| A- $79 | All units are assembled, tested, | A- $59 |
| B- $69 | carry a 90-day limited warranty, | B- $49 |
| C- $49 | and shipped pre-paid in US. | C- $29 |

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# ICOM

*HF Transceivers:* — Regular — SALE

**IC-740** 9-band 200w PEP Xcvr ..... $1099.00 **949.95**

*plus* **FREE PS-740** internal power supply &

**$50 Factory Rebate** - until gone!

| | | |
|---|---|---|
| **PS-740** Internal power supply | $159.00 | **149.95** |
| ***EX-241** Marker unit | 20.00 | |
| ***EX-242** FM unit | 39.00 | |
| ***EX-243** Electronic keyer unit | 50.00 | |
| ***FL-45** 500 Hz CW filter (1st IF) | 59.50 | |
| ***FL-54** 270 Hz CW filter (1st IF) | 47.50 | |
| ***FL-52A** 500 Hz CW filter (2nd IF) | 96.50 | **89.95** |
| ***FL-53A** 250 Hz CW filter (2nd IF) | 96.50 | **89.95** |
| ***FL-44A** SSB filter (2nd IF) | 159.00 | **144.95** |
| **SM-5** Electret desk microphone | 39.00 | |
| **HM-10** Mobile scan microphone | 39.50 | |
| **MB-12** Mobile mount | 19.50 | |
| **Options also for IC-745 listed below* | | |
| **IC-730** 8-band 200w PEP Xcvr w/mic | $829.00 | **599.95** |
| **FL-30** SSB filter (passband tuning) | 59.50 | |
| **FL-44/A** SSB filter (2nd IF) | 159.00 | **144.95** |
| **FL-45** 500 Hz CW filter | 59.50 | |
| **EX-195** Marker unit | 39.00 | |
| **EX-202** LDA interface; 730/2KL/AH-1 | 27.50 | |
| **EX-203** 150 Hz CW audio filter | 39.00 | |
| **EX-205** Transverter switching unit | 29.00 | |
| **SM-5** Electret desk microphone | 39.00 | |
| **HM-10** Mobile scan microphone | 39.50 | |
| **MB-5** Mobile mount | 19.50 | |
| **IC-720A** 9-band Xcvr/.1-30 MHz Rcvr | $1349.00 | **899.95** |
| **FL-32** 500 Hz CW filter | 59.50 | |
| **FL-34** 5.2 KHz AM filter | 49.50 | |
| **MB-5** Mobile mount | 19.50 | |
| **IC-7072** transceive interface, R-70 | 112.50 | |
| **IC-745** 9 band xcvr/.1-30 MHz rcvr | $999.00 | **899.95** |
| **PS-35** Internal power supply | 160.00 | **144.95** |
| **CF5-455K5** 2.8 KHz wide SSB filter | TBA | |
| **SM-6** Desk microphone | 39.00 | |
| **HM-12** Hand microphone | 39.50 | |
| *See IC-740 list above for other options (*)* | | |

| | | |
|---|---|---|
| **IC-751** 9-band xcvr/.1-30 MHz rcvr | $1399.00 | **1229** |
| **PS-35** Internal power supply | 160.00 | **144.95** |
| **FL-52A** 500 Hz CW filter | 96.50 | **89.95** |
| **FL-53A** 250 Hz CW filter | 96.50 | **89.95** |
| **FL-33** AM filter | 31.50 | |
| **SM-6** Desk microphone | 39.00 | |
| **HM-12** Hand microphone | 39.50 | |
| External frequency controller | TBA | |
| High stability reference crystal | TBA | |
| *Options: 720/730/740/745/751* — Regular — SALE | | |
| **PS-15** External 20A power supply | $149.00 | **134.95** |
| **EX-144** Adaptor; CF-1/PS-15 | 6.50 | |
| **CF-1** Cooling fan for PS-15 | 45.00 | |
| **PS-20** 20A switching ps w/speaker | 229.00 | **199.95** |
| **CC-1** Adaptor; HF radio to PS-20 | 10.00 | |
| **CF-1** Cooling fan for PS-20 | 45.00 | |

| *Options - continued* | Regular | SALE |
|---|---|---|
| **EX-310** Voice synthesizer (IC-751) | 39.95 | |
| **SP-3** External speaker | 49.50 | |
| Speaker/phone patch (specify radio) | 139.00 | **129.95** |
| **BC-10A** Memory back-up | 8.50 | |
| **EX-2** Relay box w/marker | 34.00 | |
| **AT-100** 100w 8-band automatic ant tuner | 349.00 | **314.95** |
| **AT-500** 500w 9-band automatic ant tuner | 449.00 | **399.95** |
| **MT-100** Manual antenna tuner | 249.00 | **224.95** |
| **AH-1** 5-band mobile ant w/tuner | 289.00 | **259.95** |
| **PS-30** 20A systems power supply | 259.95 | **233.95** |
| **GC-4** World clock | 99.95 | **94.95** |
| *HF Linear amplifier* | | |
| **IC-2KL** 160-15m/WARC solid state linear | 1795.00 | **1299** |
| *VHF/UHF Multi-modes* | | |
| **IC-251A*** 2m FM/SSB/CW xcvr | $749.00 | **549.95** |

**$50 Factory Rebate** - until gone!

| | | |
|---|---|---|
| **IC-551D** 80w 6m Xcvr | $699.00 | **599.95** |
| **PS-20** 20A switching ps/spkr | 229.00 | **199.95** |
| **EX-106** FM adaptor | 125.00 | **112.95** |
| **BC-10A** Memory back-up | 8.50 | |
| **SM-2** Electret desk microphone | 39.00 | |
| **IC-451A** 430-440 SSB/FM/CW Xcvr/ps | 899.00 | **769.95** |
| **IC-451A/High** 440-450 MHz Xcvr/ps | 899.00 | **769.95** |
| **AG-1** 15 db preamp, IC-451A/45A | 89.00 | **79.95** |
| **IC-271A** 2m, 25w xcvr | 699.00 | **629.95** |
| **IC-471A** 430-450 MHz, 10w xcvr | 799.00 | **719.95** |
| **PS-25** Internal power supply | 99.00 | **89.95** |
| **EX-310** Voice synthesizer | 39.95 | |
| **HM-12** Hand microphone | 39.50 | |
| **SM-6** Electret desk microphone | 39.00 | |
| *VHF/UHF FM* | | |
| **IC-25A** 2m, 25w, up-dn-ttp mic, grn leds | $359.00 | **319.95** |
| **IC-25H** as above, but 45 watts | 389.00 | **349.95** |
| **IC-45A** 440 FM xcvr, 10w, TTP mic | 399.00 | **359.95** |
| **BU-1** Memory back-up | 38.50 | |
| **IC-22U** 10w 2m FM non-digital Xcvr | 299.00 | **249.95** |
| **EX-199** Remote frequency selector | 35.00 | |
| **RP-3010** 440 MHz repeater | 999.00 | **899.95** |

**ATTENTION CLUBS, GROUPS, etc.**
**UHF Transceiver/Repeater SPECIAL!**
Get together and buy (10) ICOM IC-45A's at one time at the Low AES Sale Price and get the RP-3010 Repeater at 50% off List Price.

| | | |
|---|---|---|
| *VHF/UHF multi-modes:* | | |
| **IC-290H** 25w 2m SSB/FM Xcvr, TTP mic | $549.00 | **489.95** |
| **IC-560** 10w 6m SSB/FM/CW Xcvr | 489.00 | **439.95** |
| **IC-490A** 10w 430-440 SSB/FM/CW Xcvr | 649.00 | **579.95** |
| *VHF/UHF Portables:* | | |
| **IC-505** 3/10w 6m port. SSB/CW Xcvr | 449.00 | **399.95** |
| **BP-10** Internal nicad battery pack | 79.50 | |
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| **EX-248** FM unit | 49.50 | |
| **LC-10** Leather case | 34.95 | |
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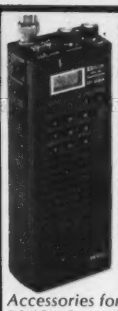
| **SP-4** Remote speaker | 24.95 | |
| **IC-3PS** Power supply for portables | 95.00 | **89.95** |
| **IC-20L** 2m amp, 10w PEP or FM | 98.00 | **89.95** |
| **IC-30L** 432 amp, 10w PEP/FM | 105.00 | **94.95** |
| *1.2 GHz equipment* | | |
| **IC-120** 1w 1.2 GHz FM xcvr | $499.00 | **449.95** |
| **RP-1210** 10w 1.2 GHz repeater | TBA | |
| Cabinet for RP-1210 or RP-3010 | 249.00 | |



*Hand-held transceivers:*
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# Grenada Log

*With a body-bag rig and gas from a bike, a ham hustled home the news. Here's history happening.*

*Bob Cunningham K1XR*
*PO Box 214*
*Fitzwilliam NH 03447*

*Tim Daniel N8RK*
*PO Box 485*
*Peterborough NH 03458*

"An invasion on 20 meters?" Those were the words Steve Mendolsohn WA2DHF heard with disbelief when he answered the telephone at a little after six on the morning of Tuesday, October 25th, 1983. Over 2000 miles away on the island of Grenada, Mark Baratella KA2ORK had been up for three hours, making ham radio history. Operating from his second-floor room at the Grand Anse campus of Saint George's Medical School, Mark had become an essential link between the island and the rest of the free world.

This was how and where it began: The social and political events leading up to the rescue mission on Grenada are well known. In the days prior to October 25th, ham radio played an important but not a primary role. That all changed, however, when Mark was summoned by medical school administrators. With phone service nonexistent, the telex dead, and the extremely unusual sound of aircraft circling overhead, Mark swung into action.

His ham gear, which had been dismantled and hidden after the days-old coup, was retrieved from its hiding place—a body bag in the school's anatomy lab. Five minutes later, KA2ORK/J37 was calling CQ on 20 meters. No response...the band was dead. Thankful for having a five-band trap dipole, Mark made a quick change to 40 meters. Tuning across the quiet band, he happened onto an early morning QSO between an operator in Texas and a K4 in Georgia.

"Break . . . Emergency . . . Break!" Naturally, the reaction was skeptical. By now Mark was hearing anti-aircraft fire in the distance. After confusion about third-party agreements was laid to rest and it was established that this was a true emergency—not a late-night bootlegger—the K4 telephoned Dr. Steve Lomazow N2DRA, Mark's QSL manager.

Due to the conversations of preceding weeks, Dr. Lomazow was more than aware that such a phone call might happen. The 40-meter frequency, however, caught him by surprise. Enlisting the help of his wife and son, Dr. Lomazow soon had a dipole connected to his rig, hastily set up near the dining room phone.

The predawn path between New Jersey and Grenada was a good one, but to ensure top-quality signals, Dr. Lomazow enlisted the aid of KC2PK, whose directional antenna and one-thousand-Watt transmitter were put on the air. There was little hesitation... KC2PK's daughter was on the island.

Mark told Dr. Lomazow that there were rumors of an invasion and asked him if he could confirm it. N2DRA's phone calls to CBS, NBC, and ABC turned up nothing. (By now conditions on 40 meters were deteriorating. The group moved to 20 meters where they set up shop on 14.250 MHz.) However, tipped off to the fact that something was happening in the Caribbean, the networks began to investigate.

Enter Steve Mendolsohn WA2DHF. His first reaction to the awakening phone call from his office, CBS Network Operations, was, "Your average invasion does not take place on 20 meters!" But after tuning in 14.250, Steve quickly changed his mind.

During KA2ORK/J37's transmissions, listeners now could not mistake the distinct sound of small-arms fire and jet aircraft. According to Steve, "It was beginning to sound like there was someone who was not just down vacationing for a DX contest!" As the word got out, hams who were close to the media were besieged with phone calls. For example, Steve logged 46 such inquiries.

As it grew light outside, in Grenada, one of Mark's fellow students used his previous military experience to monitor the activity around them. From this rooftop crow's nest, he began to identify the ships just off the beach and the aircraft overhead as belonging to the USA. Even though they were in imminent danger, Mark and the students were fascinated by the technical

expertise of the military in action.

To augment the information that they were receiving from official sources, the press desperately wanted to speak with someone on the island. With the phone and all other forms of communications dead, again, the only alternative was ham radio. Mark was inundated with on-the-air requests from the international, national, and local US media and amateur operators who were assisting the media. He refused all interviews, going so far as to deny Dan Rather any comments. (After Mark returned home, he met Mr. Rather and explained the situation and how ham radio functions.) What Mark did was to report nothing but facts. He told only of events that he could see himself or were reported to him firsthand from spotters on the roof.

Shortly after Mark started operating his Swan 500, the area lost commercial power—not an unusual event on a small Caribbean island. Prepared for this, the school had a diesel-powered generator on standby. Risking nearby gunfire, a few students made their way across campus to the generator. They fueled it, checked the oil, and started it. It had oil, but there wasn't any in reserve and it was running low. It ran for almost 18 hours before freezing up. As a last resort, they had a small Honda generator of about 500 Watts capacity. Mark put the new generator out on the balcony and started it up. After reducing his power, he started to transmit. Every time he keyed the mike, the underpowered generator groaned. However, it did the job; on-the-air signal reports were unchanged. They had enough gasoline to operate this power supply for an additional 5 to 10 hours.

It was actually needed, however, for only 3 more hours. At that time: "It's Now!...Get Down!...Get Down Now!" Those were the words one of Mark's friends used when he was instructed to get him from his second-floor "shack." The Rangers were there and it was time to evacuate. Mark pulled the plug and headed downstairs. The rescue helicopters were arriving at the beach, four and five at a time. A line of Rangers pushed the students down the beach and into the awaiting choppers. Mark wished that he still had his rig operating, as mortar fire was coming in and the helicopters were firing their cannons back to protect the students. Over 200 people were evacuated in about 15 minutes.

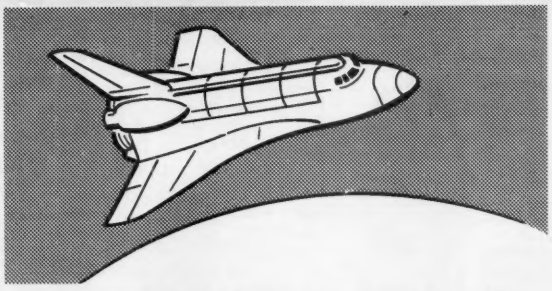
After a short flight to the recently-secured airport, the group had a few hours to collect their thoughts before being flown by jet to Barbados. On Barbados, Mark was able to phone home. After reassuring his family, topmost on his mind was letting the amateur-radio fraternity know that they were all safe. Another quick plane ride to South Carolina, and the ordeal was over.

Mark's overall impression of the entire operation was reassuring. Amateur radio proved itself again. Yes, there was malicious interference. There was also interference which was the result of some well-intentioned but nonetheless frivolous transmissions.

Licensed since his late teens, Mark epitomized the important role that young people can play in amateur radio. For KA2ORK/J37, WA2DHF, N2DRA, KC2PK, and countless others, the day 20 meters was invaded will not be forgotten soon.

The authors would like to thank WA6ITF, N2WS, WA2DHF, N2DRA, and last but not least, KA2ORK for help in researching this story. ■


## AMATEUR TELEVISION



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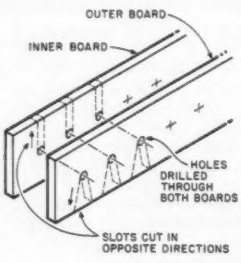


*Fig. 1.*

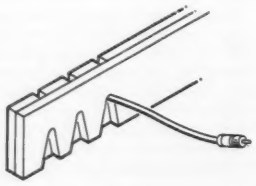

*Fig. 2.*

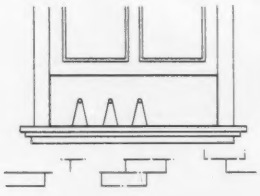

*Fig. 3.*

Some have taken it so far as to make a permanent installation, such as drilling holes in the side of the house, running the cables out, and then filling the holes with a weather-resistive material. That's good for home *owners* only.

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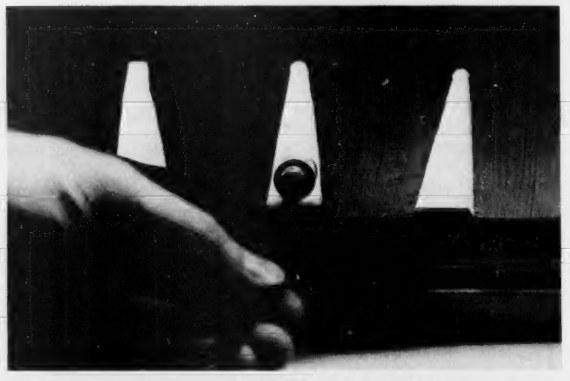

*Inserting connector through outer board.*

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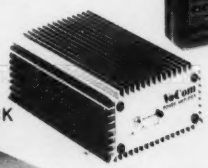

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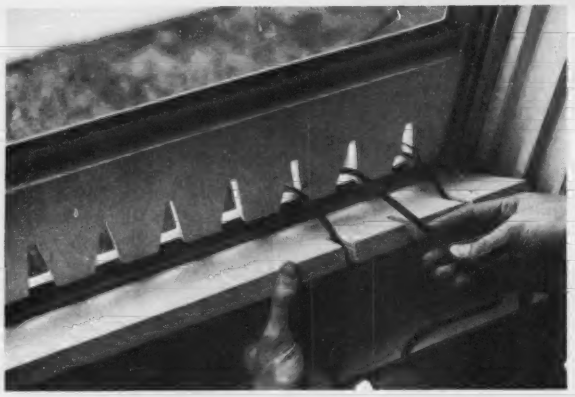

*Guiding lines through inner board.*

*Lines in; window weatherproofed.*

defacing method is to cut a board the same width as the window and close the window as far as possible down onto the board to make a tight fit. When a cable needs to reach outside the shack, a hole is simply drilled in the board and the cable is brought through.

With this method, I have found that almost every time I want to run a cable out the window the cable I have chosen to use inconveniently has connectors on both ends. Since a tight fit and a good seal requires that the hole in the board should be only large enough for the cable itself, that means that the connector has to be cut off before the cable can be inserted into the hole or removed from it.

However, by looking at the illustrations you should have no trouble in understanding the method I have found which facilitates a weather-tight seal and easy insertion or removal of any size cable without having to remove the connectors.

The method employs two boards cut to the width of the window. The boards are sandwiched together and the window is closed down onto the boards. Each time a new feedline must be brought through, just drill a hole in the center of the two boards and cut slots from the holes to one edge of each board. The slots are cut in opposite directions in the two boards so that the board which faces the outside has its slot going down and the board facing inside has its slots going up.

The slots in the outside board should be cut in a wedge shape so that when the inside board is moved out of the way, the connectors on the cables can pass through the wider end of the slots without having to remove the outer board at all. This way you can seal the outer board by caulking it or using duct tape and thus the board never has to be removed. This requires several holes and slots to be pre-cut in the outer board before it is fixed in place.

When any cable is removed, the small hole that is left behind can be filled easily with a small dab of putty, a piece of wood dowel, or cloth.

This method works well not only for coaxial feedlines but for twin-line as well since the wood helps keep the twin-line away from any metal window framing which might have some effect on the impedance of the feedline. ■


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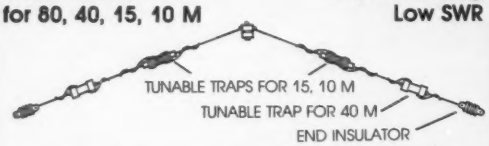


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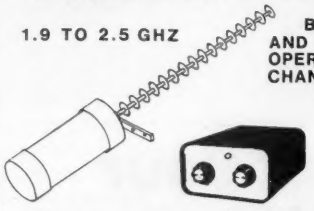

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# Sound Off!

*Here's the perfect S-meter add-on for the repeater that has everything. The higher the beep, the better the signal.*

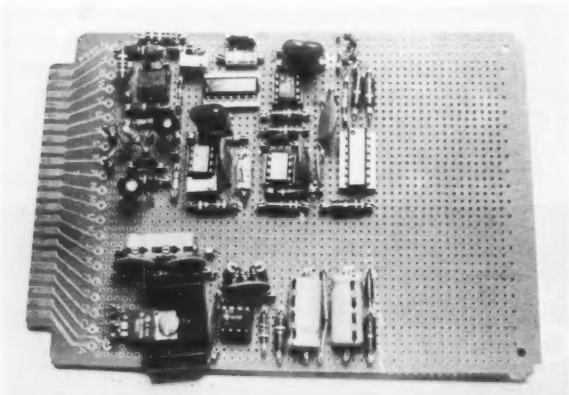
Think you've seen every kind of attachment to a repeater that there is? How about this one—an audible S-meter? If you're wondering about why in the world you would need an audible S-meter on your repeater, think about all the times that you wanted to compare rigs, optimize antenna direction or location, or just know how well you were making the repeater from a particular mobile location. If your luck was like mine, you found that no one was around at that time, or, if they were, they couldn't stay while you fiddled around with your rotator or carried the antenna back and forth across the roof a bunch of times. And even if they did stick around, didn't you ever wonder how they could determine by ear whether you were 70% or 80% full quieting?

Well, this little circuit will solve all those problems for you. Now you can make any of those tests all by yourself and know for sure whether that last change you made helped or hurt you even if no one's around. Generally, what it does is sample the first limiter voltage, amplify it, and feed it to a voltage-controlled oscillator which returns a beep proportional to your signal strength. The higher the beep, the stronger you are (up to full quieting). I've got mine on WR3AGU 147.81/.21 at Mehoopany, Pennsylvania, and it's been working great for about a year. It's set up to give a continuously variable tone beep between .2 uV and 1.0 uV. The tone frequency range is 800 Hz for .2 uV and about 2800 Hz for 1.0 uV.

All the other junk you see in the schematic diagram does things like delay the beep to give your receiver time to recover after transmit, set up a sample-and-hold circuit to hold the limiter voltage momentarily when you let up on the mike, and discharge that voltage after the beep is output, etc. More on that later in the circuit description. Depending on where you hook it up on your repeater, it can serve a dual purpose of indicating timer reset and signal strength.

The circuit isn't very complex and it shouldn't be hard for anyone with the time and initiative to design a PC board for it.

**Photo by Mike Benish K3SAE**



*Circuit board.*

### Circuit Description

IC1 is a dual op amp with a very high input impedance. This is necessary so as to not load down the first limiter stage to which it will be connected. The gain of the stage is variable and is adjusted by the 1-meg-dc amp gain control. More about this adjustment later. The output of this IC is fed through D1 to the second half of IC1. D1 ensures that the 2.2-uF tantalum capacitor is not discharged when the output of IC1a goes lower than the voltage on the 2.2-uF capacitor.

These components form a sample-and-hold circuit which holds the voltage developed by IC1a for a short time when the input signal disappears. IC1b serves as a voltage follower/impedance transformer. Its high input impedance does not load down the 2.2-uF capacitor and its relatively low output impedance feeds the MC4024 vco. The MC4024 is a voltage-controlled oscillator. The audio output frequency of this chip is deter-

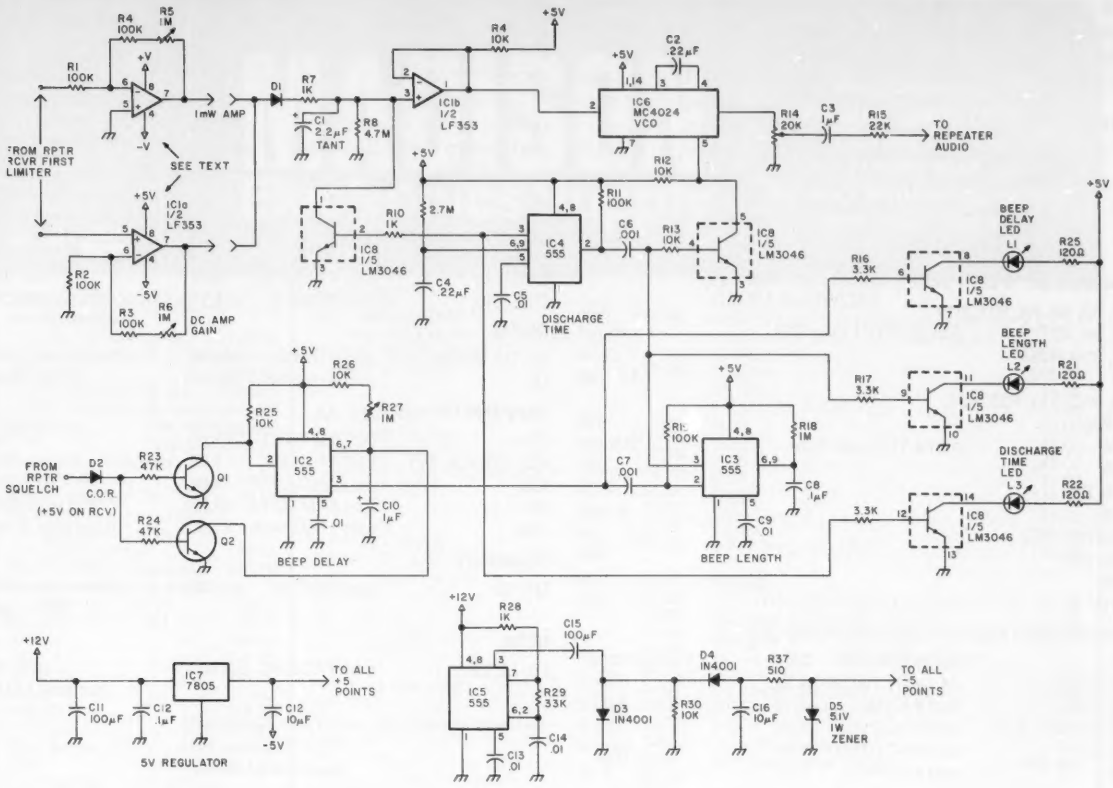



*Fig. 1. Schematic.*

mined by the voltage at its input. With the values shown, output frequencies between 800 and 2800 Hz will be generated when pin 5 is high.

The repeater COR is connected to the anode of D2. The COR must go above 2.0 volts on receive and remain below 1.0 volt when idle. The standard 0-volt low and 5.0-volt high is ideal. When a signal is received, IC2 (set up as a retriggerable monostable) is reset and its output is held high while a transmission is being received. When the received carrier disappears, IC2 then times out (how much later is determined by the 1-meg pot and the 1-uF capacitor) and output pin 3 goes low. This delay is to ensure that you release your mike button. Instead of an immediate return beep, a delay is introduced which allows time for receiver recovery.

When IC2 goes low, it triggers IC3 which is set up as a monostable. When pin 3 of IC3 goes high, it biases on the B section of the LM3046 transistor array, bringing pin 5 of the MC4024 vco low for a finite time allowing it to output a beep. After IC3 times out, its output pin 3 goes low, shutting off the vco and triggering IC4. When IC4 is triggered, its pin 3 goes high and biases on the A section of the transistor array. This discharges the 2.2-uF tantalum and readies it for receipt and storage of the next voltage level.

The other three sections of the LM3046 transistor array are used, together with their respective LEDs, as logic monitors to indicate the status of the three timers. All five sections may, of course, be replaced by five discrete transistor devices if you wish.

The fourth 555 is used in the astable mode to convert +12 volts dc to a low-current −5-volt supply needed for the proper operation of IC1. The 7805 is a three-terminal device used to regulate the +12 volts supplied to +5 volts needed for IC1 and other portions of this circuit.

### Adjustment

There are only three adjustments to be concerned with. The one-meg pot associated with IC2 is adjusted to provide the amount of delay you would like after the carrier disappears before the beep is heard. The proper amount of time is what sounds best to you. Adjustment is best done while in actual operation.

The one-meg-dc amp gain associated with IC1a takes a bit more to adjust. If you have access to a Cushman or other service monitor with a calibrated output, things are much easier.

With a service monitor: (1) Remove the LM3046 from its socket (you did use a socket, didn't you?). Short pins 5 and 3 of the socket with a thin jumper wire to permanently enable the MC4024. (2) Disconnect one end of the 2.2-uF capacitor. (3) Set the dc amp gain to minimum resistance. (4) Key up the repeater and adjust the 20k-level pot in the output of the vco to about 3-kHz deviation. (5) Apply a signal to the receiver which is just enough to break squelch. Adjust the dc amp gain slowly until a slight rise in tone pitch is noticed. This causes IC1a to output the dc level at this point which is needed to begin controlling the vco. Any larger signal will be further amplified and applied through IC1b to the vco, resulting in a higher tone from the vco. The stronger the signal, the higher pitched the tone.

Without a service monitor: (1) Perform steps 1, 2, 3, and 4 above. (2) Have some-

one with a very weak signal transmit. Adjust the dc amp gain as described in step 5 above.

### The Input Stage

IC1a's input is connected to your repeater's first limiter stage. The voltage at this point will most probably increase with an increase in signal strength. In this case, the non-inverting stage configuration is used. If it is necessary to connect to a point in your first limiter where the voltage decreases with increasing signal, then use the inverting configuration shown.

The audible S-meter has proven to be a worthwhile addition to the 81/21 repeater (WR3AGU) and I'm sure you'll find it a useful and novel feature on your repeater.

I'll be happy to answer any questions regarding this circuit. Please include a stamped self-addressed envelope. ■

**Parts List**

| | | | |
|---|---|---|---|
| **Resistors** (all ½ or ¼ Watt unless stated otherwise) | | | |
| R1, R2, R3, R4, R11, R19 | | | 100k |
| R5, R6, R27 | part # TR11-1 meg | $.39 | 1 meg pot |
| R7, R10, R28 | | | 1.0k |
| R8 | | | 4.7 meg |
| R9, R12, R13, R25, R26, R30 | | | 10k |
| R14 | part # TR-11-20k | $.39 | 20k pot |
| R15 | | | 22k |
| R16, R17 | | | 3.3k |
| R18 | | | 1 meg |
| R20, R21, R22 | | | 120 |
| R23, R24 | | | 47k |
| R29 | | | 33k |
| R31 | | | 510 |
| **Capacitors** (all capacitors at least 12 volts dc) | | | |
| C1 | part # TM2.2/35 | $.51 | 2.2 uF tantalum |
| C2, C4 | part # MY.22/100 | $.33 | .22 uF |
| C3, C10 | part # A1/16 | $.17 | 1.0 uF |
| C5, C9, C13, C14 | part # DC.01/50 | $.08 | .01uF |
| C6, C7 | part # DC.001/50 | $.08 | .001 uF |
| C8 | part # DC.1/12 | $.12 | .1 uF |
| C11, C15 | part # A100/16 | $.24 | 100 uF |
| C12, C16 | part # A10/16 | $.17 | 10 uF |
| **Diodes** | | | |
| D1, D2, D3, D4 | part # 1N4001 | 12/$1.00 | 1N4001 or equiv. |
| D5 | part # 1N4733 | 4/$1.00 | 5.1 V zener |
| **Integrated Circuits** | | | |
| IC1 | part # LF353N | $1.00 | LF353 |
| IC2, IC3, IC4, IC5 | part # NE555V | $.39 | 555 |
| IC6 | part # MC4024P | $3.95 | MC4024 |
| IC7 | part # LM340T-5 | $1.25 | 7805 regulator |
| IC8 | part # LM3046N | $1.30 | transistor array |
| **Transistors** | | | |
| Q1, Q2 | part # 2N3392 | 4/$1.00 | general purpose NPN type |
| **LEDs** | | | |
| L1, L2, L3 | part # XC209R | 5/$1.00 | general purpose LEDs |

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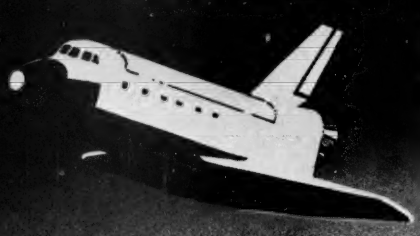

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# Some Alarming Techniques

*These burglar-proof circuits will stump second-story men and amaze possible thieves—as well as you.*

The most cost-effective way to protect life and property against fire, theft, and vandalism is with an electronic alarm system. Wayne Green has been telling us for years of the market potential for amateur radio operators in the alarm business. Having once been in the alarm business, I agree with Wayne and in this article I will share the common circuit techniques and a schematic for a simple but sophisticated residential alarm control panel.

### Closed Loop or Open Loop?

For an alarm to be reliable, its operation must not be defeated by a loose connection or broken wire in the system. Most intrusion alarms use a closed loop—a continuous loop of wire with normally-closed switches wired in series. When one of the switches is open or the metallic tape on a protected window is broken, the alarm panel responds to an open circuit on its input terminals. This type of loop is self-testing; there is only one way to make up the loop, this being with all switches closed and wires connected. Fig. 1 illustrates an example of a simple alarm control panel circuit for closed-loop operation.

An open loop consists of a chain of normally-open switches wired in parallel. Some technique for testing the integrity must be provided, since a break in the normally-open loop would render part of the loop inoperative.

Fig. 2 illustrates the use of an end-of-line diode to monitor a normally-open loop. In this circuit an ac signal is impressed on the control-panel end of the loop. During one half of the cycle the end-of-line diode conducts, supplying current to the trouble relay. Should one of the switches close, the alarm relay would drop out, setting off the alarm circuit. Should the loop open or ac power fail, the trouble relay will drop out, alerting the operator to trouble on the

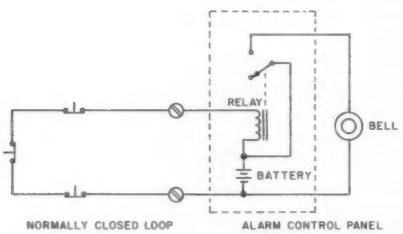


*Fig. 1. Schematic of a simple closed-loop alarm using a relay, battery, and bell. The closed loop is self-testing because the loop must be made up before the alarm is turned on.*

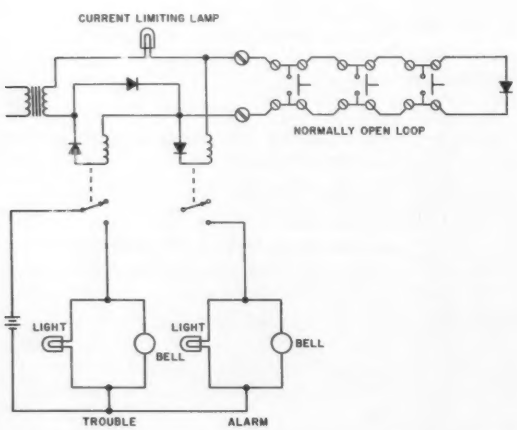


*Fig. 2. Open-loop two-wire system, using end-of-line diode, relays, and ac power supply. These are used in fire-alarm systems.*

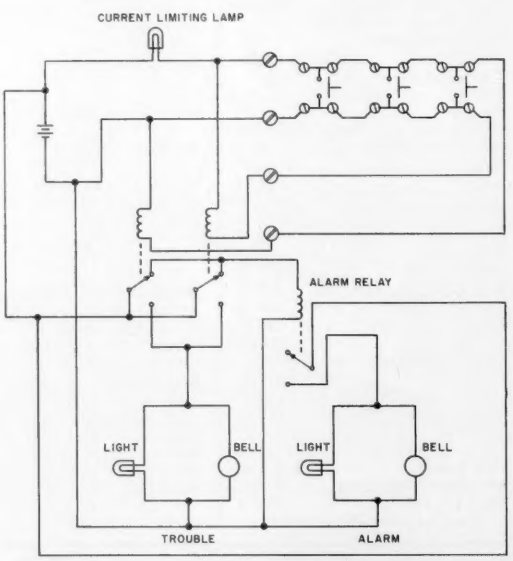


*Fig. 3. Typical four-wire open-loop alarm circuit using alarm relay. These are also used in commercial fire-alarm systems.*

line. There are other end-of-line techniques for detecting open-loop trouble; each has some problem and is considered not as good as a four-wire loop.

### The Four-Wire Loop

A four-wire loop is shown in Fig. 3. This circuit uses two relays to sense the integrity of the loop. If either relay drops out, a trouble alarm is sounded. If the open loop is shorted, both relays drop out, as does the alarm relay.

This four-wire circuit uses a single dc power supply and may be supplied by a backup battery in case of ac power failure. It should be noted that in case of relay or power failure, this circuit will fail in the trouble or alarm mode. The normally-open switches used in this type of alarm have four sets of screws for the incoming and outgoing pairs to ensure that a switch does not get left out of the loop because of a poor connection. The open loop is normally used for fire-alarm systems which are left on continuously.

### Entry and Exit

An intrusion alarm is usually turned off for part of the day and activated for part of the day. The operator must be able to turn the alarm system on and off without causing an alarm. There are two techniques for this: a high-security keyswitch mounted outside the protected perimeter and the time-delay system.

The high-security keyswitch technique uses a keyswitch with a cylindrical tumbler to bypass part of the closed loop, as shown in Fig. 4. To arm the alarm system, the operator first checks the integrity of the loop at the control panel and turns on the alarm. The operator then exits through the doors and areas bypassed by the outside keyswitch. After securing the exit door, the high-security keyswitch is opened, putting the bypassed switches back in the loop. To enter the protected perimeter these steps are reversed; first the outside switch is closed, then the operator proceeds to the alarm panel and turns the alarm off.

Entry and exit delays may be used in low-security systems where the intruder would not expect to find an alarm system, such as in a residence. When the system is turned on, the operator has a preset exit delay period before the alarm system is armed. This period is normally adjustable from a few seconds to a couple of minutes. This gives the operator time to set the alarm and exit the perimeter without setting off the alarm.

Another delay must be provided for entry. Here the operator may break the protected perimeter and still be given time to go to the alarm-system panel and turn it off before the alarm sounds. Obviously, the intruder may be given the same opportunity to find and silence the alarm before it sounds. Fig. 5 gives us a schematic for an alarm circuit which provides for entry and exit delay.

The entry and exit delays

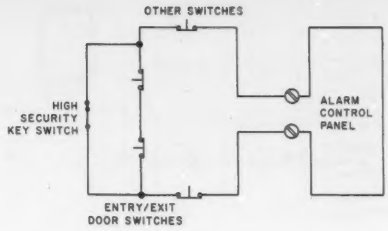


*Fig. 4. Example of how a high-security keyswitch is used to bypass entry/exit doors. This type of circuit is used on commercial intrusion alarms.*

are fixed by the choice of timing capacitors C1 and C2 and resistors R10 and R11 connected to IC3; with 1 megohm and 10 μF respectively, the delay is about 14 seconds. This is about the minimum practical delay time.

Half sections of IC2 are connected as R-S latches to hold information about the system status. System status and loop integrity are indicated by LEDs. Also included is a power supply for the system with battery backup. Normally the batteries are dry cells which are tested and replaced periodically.

**Parts List**

| | |
|---|---|
| R1–R6 | 2.2kΩ, ¼-Watt |
| R7–R9 | 330Ω, ¼-Watt |
| R10, R11 | 1 megohm, ¼-Watt |
| C5, C6 | 4.7-uF tantalum |
| C1, C2 | 10-uF, 16-volt electrolytic |
| C3, C4 | 0.01-uF ceramic disc |
| D1–D3 | 1N4001 |
| D4–D6 | Light-emitting diode |
| S1–S3, S7 | Normally-closed switches |
| S4–S6 | Normally-open, momentary-contact switches |
| IC1, IC2 | 7400 quad two-input NAND; + 5—pin 14, Gnd—pin 7 |
| IC3 | 556 dual 555 timer; + 5—pin 14, Gnd—pin 7 |
| IC4 | 7805 5-V regulator |
| RY1 | 5-V low-current relay |

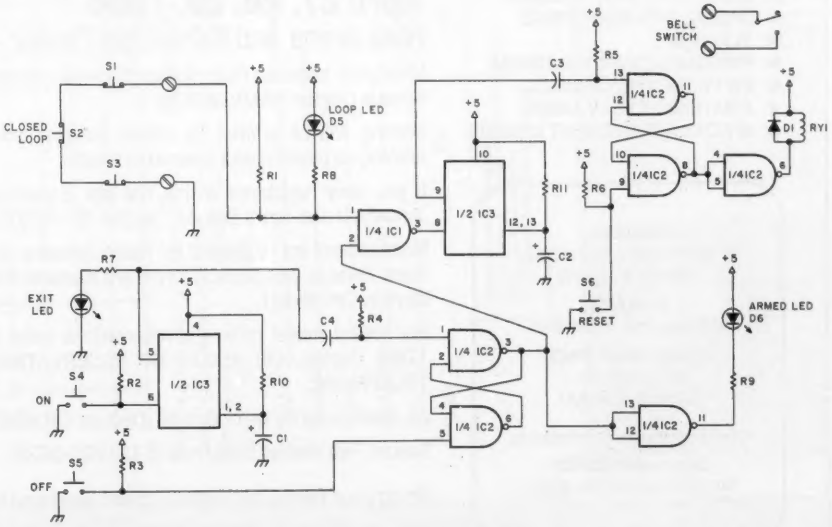


*Fig. 5. Schematic diagram of an alarm control panel suitable for residential use. Entry/exit delay is included.*

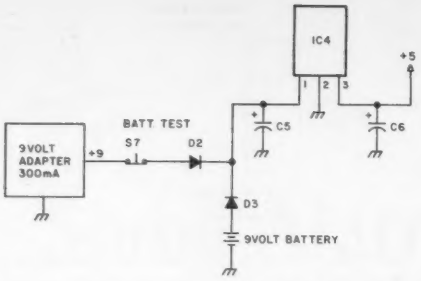


*Fig. 6. Power supply for Fig. 5. The battery is usually dry cells which are periodically tested and replaced.*

**Summons**

The systems described here all rely on a local bell to scare the intruder away and/or notify the occupants. Commercial alarms must also notify the police or fire department or some other private security office. Normally this is done over leased phone lines—pairs of wires leased from the phone company which connect the alarm panel to the central office.

In simple systems, a normal status is indicated by plus six volts dc, trouble is indicated by zero volts, and an alarm condition is indicated by negative six volts dc. In most locations, the exact nature of these signals has already been established and any new systems must conform to the existing standard. The central office receiver may vary from a plug-in zero-center meter, with latching relay and buzzer, to a small computer console which types out the name, address, and time of any alarm. Usually a small charge is levied for the use of the central system by the city or private company.

**Parts Procurement**

Commercial-quality alarm components are available from Ademco, Bourns, FBI, Moose, Napco, and Universal. These units are well engineered and built like tanks to provide years of trouble-free service. Residential-quality units are available from Midex, Seeker, Eico, and Solfan. Many of these have entry and exit delays and may not be suitable for commercial use. These are available from suppliers in many metropolitan areas.

**Selling the System**

For those interested in making a business out of selling and installing alarm systems, the thing being sold here is security, not a bunch of alarm panels, wires, switches, lights, and bells. The buyer wants to feel that he, his property, and his family are safe from fire, theft, and burglary. He wants his system to be reliable; if it fails to operate properly he wants it repaired immediately, even if it's 2 am. Once he has the security of an alarm system, he will not want to be without it. For this reason, alarms are usually sold with a service contract or lease. Remember: The customer probably won't know a thing about how his system operates.

There exists a good potential in many areas of the country for someone who can understand these simple circuits, organize a business, and be reliable in the installation and maintenance of alarm systems. For those not interested in a business, a do-it-yourself residential alarm offers a cheap, effective insurance against loss due to fire, theft, or burglary.■


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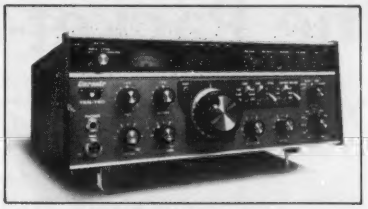

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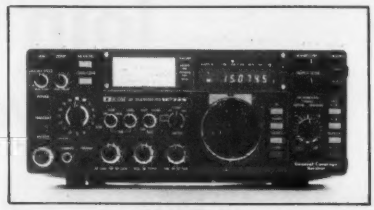

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# Join the Packet-Radio Revolution—Part III

*Don't mess up. Packet protocols and procedures are all-important, says WA7GXD, and he's been right so far.*

Now that you have a background as to what packet radio is and what it takes in the way of hardware to get a packet station on the air, it is time to go into a little more detail on the communications protocols used in packet radio.

As mentioned in Part I of this series, protocol is taken to mean the formal rules governing information transfer. There are many different types of protocols used in amateur radio today. Every time you check into a net, there are procedures to follow. If you get involved in a roundtable discussion, less formal rules may apply. If you wish to use a busy repeater, there are, again, procedures to follow. In fact, any time you wish to communicate (and sometimes when you don't wish to!) there are rules. Some are formal, such as in parliamentary debate, while others are not.

In packet radio, the protocols used are designed to enable many users to access a given channel for point-to-point communication with maximum reliability. And since computers are used (the Terminal Node Controller—TNC—is a computer), the rules must be very explicit. Because computers lack judgment, all possibilities for confusion must be defined and worked out. Thus, protocol design is a *very* critical part of designing a packet-radio system.

Do other amateur digital-communications systems have defined protocols? The answer is yes! In RTTY, the 5-level Murray (Baudot) code is used in the United States, while in Europe the CCIR Alphabet Number 2 is the standard. Holding a marking tone between characters, unshift-on-space, data rate (60, 67, 75, or 100 wpm)—these are all part of RTTY protocol. In ASCII, the 7-level code itself is part of the protocol, and in amateur usage, most of the applicable RTTY standards have been carried over, including such things as 170-Hz shift and the 2125/2295-Hz tone pair.

As digital communications have progressed, more rigidly-defined protocols have emerged. AMTOR, perhaps the most sophisticated RTTY system in amateur use, has evolved as an error-reducing communications system and is defined in CCIR Recommendation 476-2. In commercial packet work, the International Standards Organization (ISO) has proposed a 7-layer model for packet-switching networks (see Fig. 1).

The first level, called the Physical Layer, deals with interfacing the user's terminal to the packet system. In the case of amateur packet radio, it is also the radio interface and the modulation scheme. While there is no standard in amateur practice at this time, there have emerged several de facto standards. RS-232 is the common interface between the packet system (usually a TNC) and the terminal. 1200 baud is the normal signaling speed on the packet side, using AFSK with 1000-Hz tone spacing using tones of 1200 Hz and 2200 Hz. Since there is no standard among amateur radio manufacturers for audio connectors or pinouts, no standard is possible for this physical interface.

The second level is the Link Layer. This deals with the actual format of the frames of information that make up a packet. It cares nothing for the data in the packet, but rigidly defines the address and control fields as well as the flags and the Frame Check Sequence (FCS). It is at this level that amateurs have come to agreement and adopted a standard called AX.25 level two. This protocol was first publicly proposed by AMRAD and adopted, with certain modifications, at a special meeting called by AMSAT in October, 1982. It was first put on the air by Tucson Amateur Packet Radio (TAPR) on the then-new TAPR TNC in December, 1982, and has since been coded into software for the Vancouver Amateur Digital Communications Group (VADCG) TNC by Hank Magnuski KA6M and others.

The next level, the Network Layer, is the focus of much experimentation today. When implemented, it will provide for inter-group linking as well as support multiple connections for, say, a roundtable with positive frame acknowledgment.

The functions of this level overlap somewhat with level four, the Transport Layer. It is the successful operation of amateur packet radio at these levels that will herald a new era in amateur-radio communications,

opening the way for an extensive, high-speed, highly-reliable communications network on a continental scale. Experiments with Phase IIIB, HF gateways, and the like are precursors to amateur level three.

The last three layers, Session, Presentation, and Application, deal with such things as CRT screen control, character sets, and the like. Amateur packet operation has managed to blur these areas with standard usage. For example, ASCII is the normal mode of character encoding. Bulletin boards are running at level two.

In fact, the definition of the digipeater function in AX.25 level two is actually a level three "kludge" to allow limited intermediate linking. This is not necessarily bad; it just shows that amateurs tend to adopt and adapt until things suit them for the unique environment in which we operate.

At the lowest level, an RS-232 interface has become the de facto standard for communicating between a TNC and a computer or terminal. The TNC looks like a modem (Data Communications Equipment, or DCE) while the computer or terminal is defined as Data Terminal Equipment (DTE).

### A Protocol-Related Problem

Even at this low level, problems may arise. What if the receive buffer in your computer gets full, or the lines you are reading start to scroll off the screen of your terminal? What if the packet channel is so clogged that the transmit buffers in the TNC are getting full? These problems are solved by the application of a *flow-control algorithm* (computerese for a method of solving a problem—hopefully one that doesn't introduce other problems!).

Flow control is handled in the TAPR TNC by both hardware and software, although the software has to recognize the "hardware" solution.

In the case of the terminal (or computer—we'll use "terminal" to mean both) wanting to tell the TNC to stop sending data, the terminal may either (a) set the TNC's Request-To-Send (RTS) line false or (b) emit an X-OFF character (usually Control-S) to the TNC. In the first case, the TNC will immediately stop sending data to the terminal. In the second case, if the TNC has been told to, it will recognize the X-OFF character and cease sending data. Note that if the TNC is operating in a so-called transparent mode, only the hardware solution may be used, since in this mode the TNC passes all data, ignoring commands.

To resume data flow to the TNC, the CTS line may be set true (if the hardware control was used) or the X-ON character (typically set as Control-Q) may be sent to the TNC. (With the TAPR TNC, the X-ON and X-OFF characters may be user-defined and the default characters are given here.)

In the case of the TNC wanting the terminal to pause in sending data, it will set the Clear-To-Send (CTS) line false, returning it true when ready to again receive data from the terminal. Thus, flow control between the TNC and terminal is defined and provided for in the TAPR TNC "user interface" protocol.

The above discussion is a simple example of the sorts of problems that must be solved in defining a usable protocol for digital communications. While the details can become quite involved, the rest of this article will deal with the issues in a more general framework. The idea is not to make you an instant protocol expert but to give you some insight into the general workings of amateur digital communications with particular emphasis on the recently-adopted AX.25 packet-radio protocol. First, however, let's take a look at how amateur packet protocols developed.

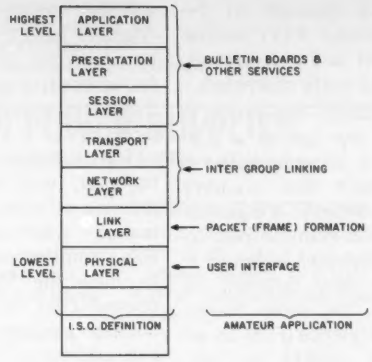


*Fig. 1. ISO 7-layer protocol model.*

### Early Packet-Radio Protocols

At the risk of oversimplification, there basically are two ways of handling packet communications. One is to have a master-control station acting much like a net-control station in traditional amateur practice. The other is to have all stations equal, as in casual amateur operation. Not surprisingly, both methods have been used in amateur packet radio. Since the Canadians were allowed packet operation first, they implemented both first.

One system was developed in which a master-control station would *poll* each station in its list and each station would in turn pass along any traffic. The advantages are apparent: Everyone takes his turn and any potential conflicts in using the frequency are thereby resolved. The disadvantages are more subtle: How does one get on the list, and what happens if the list is long but only two or three stations are active? Do the few active users have to wait for the inactive stations to be interrogated by the master station between every transmission? And of course there may be a real problem if the master station goes down.

Another system was developed in which each station had its own identification and could attempt to access the channel at will. The possibility of "doubling" (called a *collision* in packet jargon) became real with this system, but communications were somewhat more robust because a central controller wasn't needed. And you didn't have to figure out how to get on the list.

The polling system is used in very few active packet areas now, and a variation of the second system became the de facto standard. Developed by the Vancouver Amateur Digital Communications Group, the Vancouver protocol spread with the VADCG TNC. Nearly all early work with packet radio in the United States was based on this TNC and protocol.

### Features of the Vancouver Protocol

The Vancouver protocol allowed two stations to *connect* and carry on point-to-point communications with positive acknowledgment via a *handshake*. High-Level Data-Link Control—*HDLC* (see Part I of this series, September, 1983, issue of *73*) was used for assembling and disassembling packet *frames*, and Non-Return to Zero Inverted (NRZI, pronounced nurzi) encoding of the data stream was used to allow clock recovery, since HDLC is a *synchronous* pro-

tocol (as opposed to the *asynchronous* RTTY format with start and stop bits attached to every character).

In addition, this protocol allowed the use of a *digipeater* for allowing stations to connect that couldn't connect directly. A digipeater is similar in this respect to a voice repeater, although it is really very different. It performs the same Frame Check Sequence (FCS) on an incoming packet as any other packet station, rejecting those that are corrupted. It then generates a new, and slightly different, packet which it sends. The modifications are in the address (and possibly the control) field, much like the changing preamble in message traffic. The digipeater is thus more like an automated traffic-handling station than a repeater.

The Vancouver protocol also allowed a packet to contain multiple *frames* of information. Up to seven frames could be sent in one transmission, and the acknowledgment (ACK) would contain a number indicating how many frames were successfully received. This had the advantage of increasing the amount of data that could be sent in a given time period (called channel *throughput*) by reducing the number of times the channel had to be "turned around" to acknowledge receipt of data. At 1200 bits per second (bps), radio performance becomes the rate-limiting factor.

Finally, the Vancouver protocol provided for certain types of *supervisory* frames for control of the data link.

Unfortunately, there were problems, or more properly, limitations with the system. For one, only a single digipeater was allowed. What if two stations wanted to connect that needed two, or even three, intermediate relays? How could multiple stations exchange data and still get positive acknowledgment from the other stations? What if a station found itself in range of two digipeaters (overlapping networks)?

The greatest limitation, however, was in the addressing scheme. In conformance with commercial HDLC implementations, and to allow the TNC's HDLC control chip to screen incoming packets, a single-byte addressing scheme was developed. Due to part of the HDLC standard, only seven (7) bits are allowed in an address byte, meaning only 128 addresses can exist on a given channel. The digipeater had to share in all of this, certain address fields had to be reserved for various reasons, and the result was that a maximum of 31 stations could be on a given channel.

This may not seem like a problem since that would be a very congested channel, but the hardware used required that the station's special ID code be burned into the TNC's memory. Since not everyone in an area is likely to be on at any given time, 31 *addresses* can be very limiting because it then implies only 31 packet stations can exist in an area, active or not. What if a visitor comes into the area with the same address as a local? Who assigns the addresses? What if a person is in range of two or more networks, and his address is used in more than one of them? The list goes on.

**Dynamic Addressing**

At the time TAPR was forming, the protocol issue was taken very seriously. The hardware for the TAPR TNC has provision for changing addresses, and many other parameters, by inclusion of a *nonvolatile* memory chip that requires no battery backup yet can be changed by the user with a simple command (see Part II of this series, October, 1983, issue of *73*).

A protocol was designed that would have an "address server" to assign addresses to any stations that came on frequency. When the station checked out, its address would be removed from the active list, making room for other active users to join in. The "net-control" station would poll the users on the list from time to time to see if they were still on channel to prevent a station that had "died" from hogging an ID. The first station on a channel would become the address server, and this function could be passed on to any other station by command. Further, if a station detected the absence of the address server, it could then take over the function.

Finally, the address server would send out a broadcast message to all stations whenever a station came on or left the channel. This would allow a user to check the "system-status table" in his TNC to see who was on! It also would smooth the transition if the address server went down for any reason.

This *TAPR/DA* protocol is presently under continuing development and may be undergoing on-the-air tests by the time this appears in print.

Unfortunately, the protocol is fairly complex and the team implementing it in software has met with delays beyond their control. Further, adapting it to existing VADCG TNCs may be impractical without extensive modifications to that TNC.

**AX.25 Level Two**

In October, 1982, in conjunction with the AMSAT annual meeting, Tom Clark W3IWI called a meeting of the various packet groups to settle on some sort of level 2 protocol (the level at which the TNCs communicate with each other). The reason was very simple. With the successful launch of the Phase IIIB satellite, a digital-communications channel with predictable reliability would be available. If the various packet groups were all doing their own thing, a Tower of Babel would result with no two groups speaking the same language (protocol). This would result in either (a) chaos, or (b) extreme underutilization of the channel resource. Therefore, a common protocol had to be defined sufficiently in advance of the satellite launch to allow it to be coded in software and tested on the air.

Represented at the meeting were AMRAD (Washington based), PPRS (San Francisco based), SLAPR (St. Louis based), TAPR (Tucson based), and of course, AMSAT (also Washington based). New Jersey was also represented, and the groups' membership base covered most active packet sites. Unfortunately, the various Canadian groups were unable to attend.

Several proposals were espoused, with each group defending its particular approach(es) to the problem. Tom's strategy, essentially, was to lock everyone in a room with no departure allowed until agreement was reached. Surprisingly enough, it worked! What eventually emerged from the meeting was a modified form of the AMRAD AX.25 level-two protocol, which is an adaptation of the commercial X.25 packet-switching protocol, level two.

Essentially, this protocol provides for the various functions of the earlier Vancouver protocol with a number of additional features. Point-to-point connections are allowed, with positive acknowledgment of frames. Up to seven frames may be included in a packet. Flow control between packet stations is defined, so a receiving TNC may tell a sending TNC to stop sending traffic for a while (to prevent buffer overflow). A digipeater is allowed, and its functions defined. HDLC frames are

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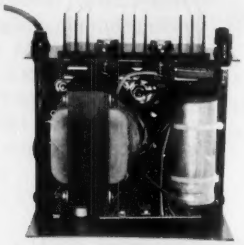

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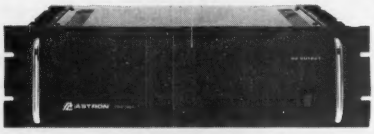

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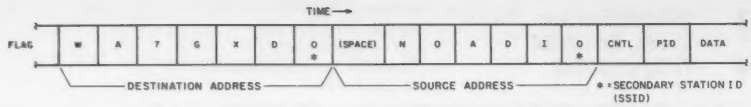


*Fig. 2. Typical AX.25 non-digipeated address header.*

*Fig. 3. Typical AX.25 digipeated address header.*

used, with NRZI encoding and zero-bit stuffing.

The major differences lie in the addressing scheme. Whereas the Vancouver protocol allowed only 31 or so stations, the AX.25 system effectively allows over ten times the licensed amateur population to be active at once!

Why is this so important? Recall that the Vancouver protocol used single-byte addressing. The problem of a new packet station coming on channel becomes real when a channel exists that allows over 50% of the world's amateurs (theoretically) to have access at one time, as in the case of the Phase III satellite.

In AX.25, the amateur station callsign is encoded into a 7-byte field. This allows for a six-character callsign with an additional byte as a qualifier. This may be necessary when, for example, a packet station has multiple TNCs that must operate under one station call. This occurs fairly frequently, with some amateurs providing a bulletin-board service or a gateway station in addition to their "normal" packet station.

Both the sending station's and the intended receiving station's callsigns are in the address field, making it 14 bytes in length. A digipeater may be *specified* (you could be in range of multiple digipeaters), in which case its callsign must be included, making the address field 21 bytes in length.

Recognizing that future protocols may emerge, the packet group decided to append a Protocol IDentification byte (PID) to the control field of the frame to let the receiving station know which protocol was in use, and AX.25 was assigned an identifier.

The advantages of this system are numerous. No longer must an amateur worry if another station has the same ID when he receives a packet. Many users may be accommodated (from an addressing point of view) with no effective limit. Monitoring of a channel becomes simplified, with a monitoring station able to identify (by callsign) the source and intended destination of every packet receivable at his location.

Of course, nothing is free, and AX.25 has its costs. The main problem is that the address field is quite long, being 21 bytes if a digipeater is used. At TAPR, we wanted to play with multi-hop packeting, so we allowed up to eight digipeaters to be specified. This makes for an address field of up to 70 bytes! This is a lot of overhead merely to send a zero data-length ACK.

Another limitation of AX.25 is that it doesn't allow for the typical amateur practice of roundtable discussions. Since a station may connect only to *one* other station, some sort of monitor mode must be enabled to see activity from other packet stations. If the "monitored" FCS is corrupted, the packet is discarded. In the case of very weak signals, it is common to miss a lot of the monitored activity. Some provision must be made to accommodate this type of networking, and it will most likely take place at level three. This problem appears to be unique to amateur packet requirements at present, so we must pioneer and develop this capability.

The lack of multiple connectivity poses another problem. Suppose a station has a computer mailbox or bulletin-board service available on packet. Since only one connection can be maintained at a time, only one user can check in at a time. If others wish to check for messages, etc., they must wait until the first user disconnects. If he suffers a power outage or otherwise leaves the air without properly disconnecting, the mailbox station will lock up until reset. Thus, other users are denied access.

There undoubtedly will be further experimentation with link-level protocols, but AX.25 forms a sound basis and a common language for such development to build on.

### A Typical Connection

To illustrate the functioning of packet protocol, an example of a typical connection sequence follows. (Note that in packet parlance a connection is merely establishing contact with the desired station.) Let's say that station WA7GXD wishes to connect to station NØADI. WA7GXD would type at his terminal: C NØADI.

A packet would be sent that could be represented as—: FLAG : NØADI : WA7GXD : SABM : FCS : FLAG:.

Note that the destination station callsign precedes the sending station callsign. The control field SABM means "Set Asynchronous Balanced Mode," which is data-communications talk for "connect me to the other guy and treat us as equals—no one is a control station."

Assuming NØADI is on frequency and his TNC is allowed to accept a connection request (he is not already connected with someone else), his station would respond with—: FLAG : WA7GXD : NØADI : UA : FCS : FLAG :.

In this case, the callsigns are reversed and the Unnumbered Acknowledgment (UA) is sent in the control field to ACK the connect request. At WA7GXD's terminal, the following message would be displayed: ***CONNECTED WITH NØADI, while NØADI's terminal would display: ***CONNECTED WITH WA7GXD. At this point the TNCs would enter the CONVERsation mode. Now any information entered at either station will be transmitted to the other station.

When the QSO ends, one station, say NØADI, will place his TNC in the Command Mode and enter: D WA7GXD, at which point his TNC would send out a packet like—: FLAG : WA7GXD : NØADI : DISC : FCS : FLAG :, where DISC is the control code to disconnect, and WA7GXD's TNC would respond—: FLAG : NØADI : WA7GXD : UA : FCS : FLAG :, and each terminal would then display: ***DISCONNECTED.

While in the connected mode, any information entered at one station's TNC will be sent to the other station and positive acknowledgment utilized to ensure that the receiving station in fact received the frame cor-

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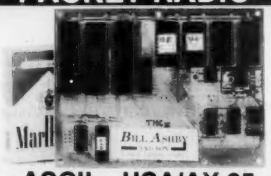

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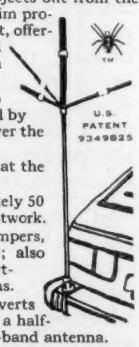


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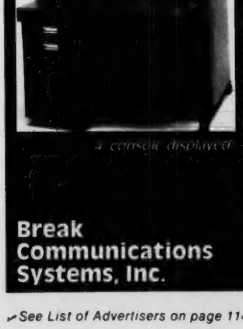

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The ARRL publishes the *Proceedings of the Second Amateur Computer Networking Conference* held in San Francisco in March, 1983. Copies are available from League Headquarters for $9.00 postpaid. Topics covered include the complete AX.25 specification, papers on the software and hardware aspects of the TAPR TNC, and other developments such as AMRAD's HF packet modem and Sweden's SOFTNET system.

Tucson Amateur Packet Radio's *TNC Manual* covers operation of a packet station in detail. Complete information is given on the TAPR TNC, including construction and checkout. Appendices include radio hookup and the complete AX.25 specification. This manual is available from TAPR for $20.00 postpaid in the US and Canada.

TAPR also publishes the bimonthly *Packet Status Register*, which is devoted exclusively to packet radio. Membership is currently $12.00 per year.

AMRAD, PO Drawer 6128, McClean VA 22106, publishes the monthly *AMRAD Newsletter*, which contains columns on packet radio. Annual dues are currently $15.00.

rectly. If the receiving station does not send the required ACK, the sender will repeat it. This goes on for up to *RETRY* times (RETRY being a user-entered parameter telling the TNC how many times to retry sending a packet before giving up and assuming the path no longer is usable between the stations).

The reasons that the sending station may not receive and decode an ACK are many. The receiving station may not have sent it due to (a) corrupted or garbled data bits, (b) someone else transmitting over the packet (a collison), (c) the receiving unit failed, (d) etc. The ACK may have been sent but not received correctly by the sending station for the same or other reasons.

In order to minimize the chances of a transmission getting stepped on or collided with, a station wishing to transmit will first listen and ensure that it doesn't hear any packet activity. Only then will it transmit. Further, if it is retrying a transmission, it will wait an additional *random* amount of time before transmitting. This helps ensure that two stations don't get "locked" and continually collide with each other.

If the retry count is exceeded, the station attempting to send will then report to the terminal:

***DISCONNECTED
RETRY COUNT EXCEEDED.

Thus, the operator is kept informed of any changes in the state of the communications channel, and valuable channel time isn't wasted in continually trying to maintain contact with a station that may not even be on the air.

From the above example it can be seen that the protocol issues involved in packet radio can be very complex, but that if properly approached, the result can be extremely reliable communications and efficient sharing of amateur frequencies.

**Applications**

No discussion of packet radio techniques is complete without some mention of the mulititude of practical applications of packet radio in the amateur environment.

Apart from FCC-mandated "advancement of the state of the radio art," packet provides unique opportunities for experimentation and public service.

Consider the aftermath of a tornado, earthquake, volcano, or other disaster. Usually, the first emergency traffic to be handled is done via amateur radio, especially if the damage is severe enough to knock out commercial lines of communication. In many cases, the traffic entered into the communications system far exceeds the ability of the system to handle it. The network becomes saturated and delays increase. It may take hours or even days to get all the messages handled.

Typically, voice or CW traffic nets are limited to a realistic rate on the order of tens of words per minute. Fatigued operators are subject to errors in copying and otherwise handling the information. As time wears on, the error rate increases.

RTTY or ASCII offers some improvement in system capacity, but errors are still likely.

On the other hand, packet offers the capability for operators to enter traffic without having to listen first (the TNC does that for them) and allows error-free communications to occur on a channel at nearly 1200 wpm (not quite 1200 due to ACK delays and the like). Multiple messages can be "in flight" at any given time, and the TNCs can sort it all out. Since the TNC likely is coupled into a computer system at some point, traffic can be passed to commercial lanes as they become available. Automatic logging of third-party traffic becomes trivial. And system capacity is on the order of 20 times that of RTTY. The capacity is even greater compared to CW or voice nets, especially when operator fatigue is considered.

As another example, consider the computer-minded amateur. Perhaps he has developed a program he wishes to share with another amateur. He can place his TNC in *transparent* mode, where it passes all data offered to it, and send a binary file dump to the other amateur, who passes it directly to his computer. Errors are trapped before the data is passed through, so the recipient can be sure that if he receives the program, it is right.

Another system used extensively on packet right now is the bulletin board, or computerized mailbox system. Amateurs may leave messages for other amateurs or get general information items, etc.

PACSAT is a proposed system much like a bulletin board except that it will be on board a future AMSAT spacecraft. Having as much as 2 megabytes of memory, PACSAT will fly in a Low Earth Orbit (LEO) similar to OSCAR 8 or UoSAT. The PACSAT concept is a pioneering one in the use of low-cost space technology since it is far cheaper to inject a satellite into an LEO (say, via a $10,000 Shuttle Get-Away Special) than to inject one into a geostationary slot (for a few million dollars). Further, there are many more LEO-launch opportunities than there are geosynchronous ones.

PACSAT will enable a low-power ground station with relatively unsophisticated antenna systems (a whip will do!) to leave and retrieve messages with PACSAT. Since we all don't live and work on the same schedule, PACSAT opens up a brand new opportunity for non-real-time "store-and-forward" communications.

For satellites such as AMSAT Phase III, which require a fairly complex ground station, packet offers the opportunity for several stations to share a common satellite link. By means of gateway operation, where one packet station has the needed equipment to track and communicate through the satellite, other packet stations can use the facility by operating through the gateway much like using a digipeater to increase a station's effective range. Similarly, HF and high-speed UHF/mi-

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crowave links may be established with a gateway concept to allow other packet stations to utilize the resource.

Resource sharing in itself is an exciting application of packet radio. Perhaps a club is heavily involved in computing and wishes to purchase a high-capacity data-storage medium, such as a 100-megabyte Winchester drive. If the unit is networked into a packet channel, the various users may access it at will.

Of course, some of these activities, such as resource sharing, will require higher levels of protocol to be defined and developed, but the potential is there and they undoubtedly will get implemented.

### Wrap-Up

This series of articles has introduced you to packet radio as it presently exists, with a short look into the anticipated future. An overview was given in Part I, where certain fundamentals were presented and a packet station analyzed.

Part II went into some detail covering packet hardware, with the specific example of the TAPR TNC given. Sufficient information was presented to enable the ambitious constructor to build a TNC for packet operation (and kits are now available).

This last installment has given an overview of packet protocols and applications. While not exhaustive in any sense of the word, some history and examples have shown the types of issues involved and the present level of packet communications capability.

For further details on amateur packet radio, I encourage you to write to Tucson Amateur Packet Radio, PO Box 22888, Tucson AZ 85734-2888. ■

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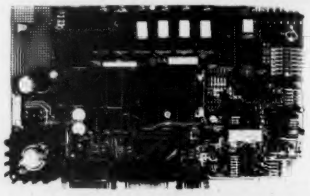

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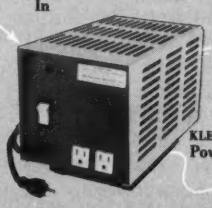

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# The CW Stationmaster

*Regeneration turns the worst signal into a CW symphony. And that's not all you get when you build this station accessory.*

Every CW operator has (at least) two desires: to improve his ability to copy code through QRM and to be able to gauge accurately how fast he or the other fellow is sending. CRASH is a device which will enhance both abilities and provide a few extra options for the CW fan.

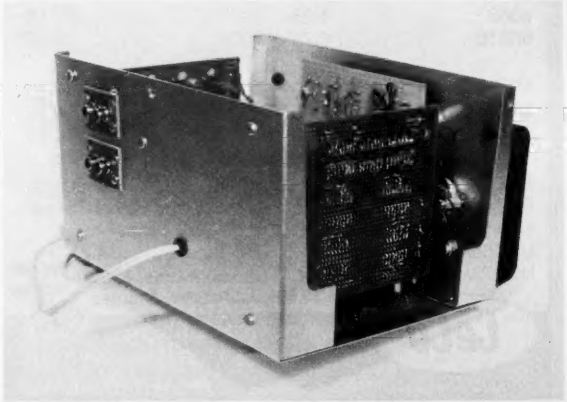
CRASH—Code Regenerator And Speedometer Hybrid—uses modern phase-locked-loop circuitry to provide good CW regeneration for clear copy. In addition, it counts the code speed of both transmitted and received signals. As a bonus, the unit serves as a code-practice oscillator that permits the instructor to adjust his speed accurately.

The hybrid part of the name CRASH derives from the sources of the ideas that went into its development. WB4TYL developed a very straightforward CW speedometer, "The Confidence Builder" (*73*, September, 1980, p. 134). One of the drawbacks of the unit was that it did not work well with received signals, since it responded to all signals in the receiver passband. The cure for this problem emerged from W3BYM's "Golden Articulator, a CW Regenerator for Amateur Receivers" (*Ham Radio*, October, 1980, p. 64). The heart of this unit is an LM567 phase-locked-loop tone decoder with a very narrow passband. Combining the two circuits became an easy task, since both made extensive use of LM555 timers, very handy devices indeed. The remaining chips are standard TTL ICs, plus an optocoupler and an LM386 audio amplifier.

By combining the two circuits, with additions and modifications, we achieve the following results:

- a CW regenerator with a narrow, variable frequency passband for single-signal reception;

*Front view of completed CRASH unit.*



*Internal view.*

- automatic or manual return from the regenerator function to receiver audio;
- a CW speed counter which updates every five seconds;
- provision to count either transmitted or received code speed;
- a code-practice oscillator suitable for training Novices through Extra-class hams by precisely setting the practice speed;
- optically isolated keying of the unit in the CPO function;
- digital output for audio input, hence the possibility of keying other devices, such as a computer or TV readout;
- relatively simple circuitry through extensive use of 555 timers;
- a design amenable to one-stage-at-a-time building and adjustment.

Even if you do not want to copy CRASH as a total unit, there may be some useful ideas in it for other projects around the shack.

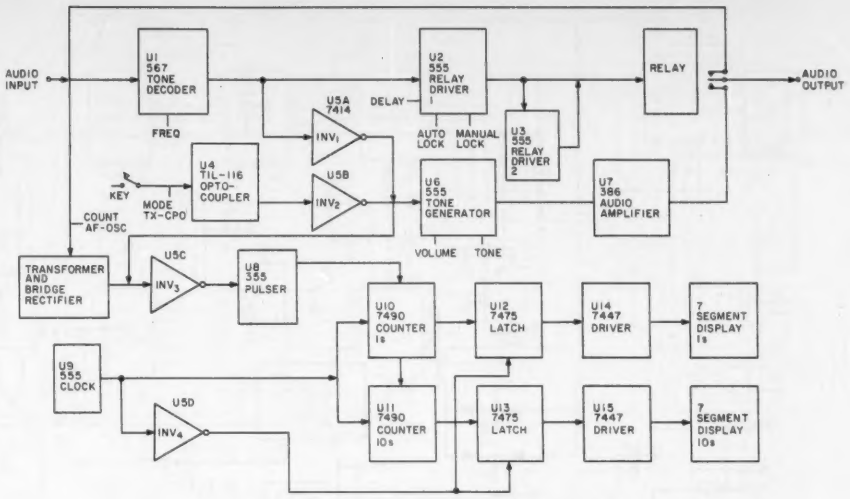



*Fig. 1. Block diagram of CRASH.*

### Functional Analysis

Although the circuit diagrams (Figs. 2 and 3) appear complex, the functions break down in a very direct manner. Fig. 1 provides a block diagram of the entire unit to make clear what happens to CW entering at the audio input jack. Since there are so many 555s, each has been given a functional name for easy identification.

When receiving CW, the 567 tone decoder is the first step in the signal processing. It has a very narrow bandwidth, even with high inputs: 14% of the audio frequency. Over the range of the decoder (400 to 2000 Hz) this amounts to 56 to 280 Hz, a figure excellent for CW, but also capable of producing ringing in most filter designs. Since we throw away the audio at this point and create our own in a later stage, ringing is no problem.

From the decoder, which produces a digital low when a signal is present, we move in three directions. One is to a tone generator (555) which produces new CW in the astable mode. Adding the LM386 amplifier lets us change the square-wave output into something a bit less harmonic-laden, but still not a pure, monotonous sine wave.

The second direction is to a pair of 555 relay drivers. The first has variable delay time and is activated by the presence of CW plus a short press of the spring-loaded toggle switch. There is also a manual switch to change from receiver audio to regenerated CW. The second relay driver has a fixed 2-second period and is activated by the first when its cycle ends. This permits time for continuing CW to reactivate the first driver, thus holding the relay in for the entire transmission.

The third direction from the decoder is to the 555 pulser which triggers the counter. For each leading edge of a dot or dash, the pulser sends a very short (10-ms) pulse which the counter section counts during a 4.7-second period. The readout provides a display of the code speed.

The counter section itself is very standard and might be considered obsolete in the face of new combined devices available for counting and readout work. A 555 clock provides adjustable 4.7-second highs to enable counting and a brief .1-second low for resetting and latching. The 7490s build the count during the high, and their last count is latched in the 7475s by the low while the 7490s reset. The latched count is converted to 7-segment display format by the 7447s and read out on the common anode displays. The counting section runs continuously in all modes of operation of CRASH, and thus can tell us the received speed, the transmitted speed, or the CPO speed.

Back at the main board, there is a provision for switching in speaker audio to the pulser through a step-up transformer and a bridge rectifier and filter. One section of a 7414 Schmitt trigger inverter provides a sharp square signal to cue the 555 pulser. This section is most useful in checking transmitted speed by using the sidetone. Since the sidetone will rarely be in the passband of the decoder, it will not register unless we retune (a bad idea) or unless we use a wideband circuit (a better idea).

The tone generator and pulser also can be triggered directly so that we can use the CRASH unit as a code-practice oscillator. Since all my equipment is set up for negative-voltage keying, an optoisolator/coupler (TIL-116) with a negative supply permits me to switch to the CPO mode and key a compatible voltage. The inverter provides the necessary high for the tone generator and pulser. In fact, the inverters shown but not mentioned are also placed in the circuit just to make sure that each device receives a controlling signal of the proper high or low state, as needed.

For the entire unit, a relatively simple power supply suffices. The five-volt supply needs to be very well filtered (since we are working with audio and not just digital signals) and well regulated (for TTL chips). In fact, the combined digital-audio techniques represent a second reason for calling CRASH a hybrid circuit. The negative supply is uncritical; with component adjustment, anything from −15 to −50 volts will work.

### Circuit Details

Having run through the entire unit, let us look at some of the circuit details that bear mentioning, either because we might want to

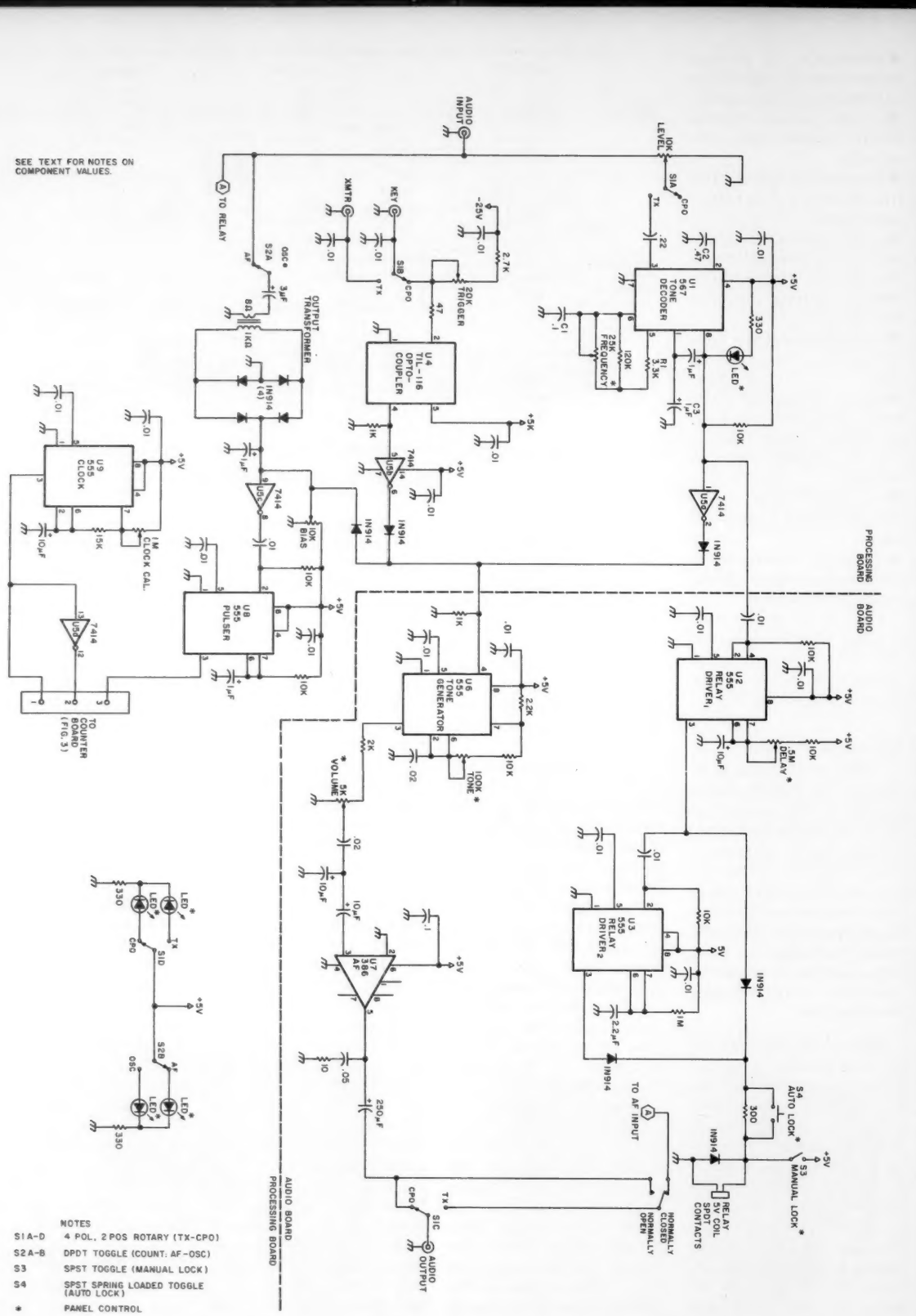



*Fig. 2. Processing and audio sections of CRASH.*



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experiment with them or because some caution may be in order. Fig. 2 will aid us here.

The 567 tone decoder chip is extremely versatile, and a data book will provide you with enough information to experiment with values. The frequency range of the unit with the resistor and capacitor values shown at pins 5 and 6 runs from a little over 400 Hz to just above 3000 Hz. The last thousand Hz are extremely compressed, and 2000 Hz is the useful upper limit for tuning in signals. If you prefer a different range, the frequency is determined by the formula $F_O = 1.1/R1C1$, where R1 is the series-parallel combination of the 25k pot, the 120k resistor, and the 3.3k resistor, and C1 is .1 uF. The minimum resistance should be no less than 2k.

With most received signals, the input signal level will run above the 200-mV level at which the decoder limits and the bandwidth levels at 14%. For maximum speed of the decoder, that is, the fastest rate of cycling in response to received code, C2, the bandwidth filter should be derived from the formula C2 = 130 uF/F1, where F1 represents the lowest frequency to be used. This gives a value of .325 uF, and hence the .47-uF capacitor shown. C3, the output filter, should be about twice the value of C2 as a minimum, hence the 1-uF unit. The 1-uF feedback capacitor between pins 8 and 1 provides suppression of chatter, that is, multiple on-off cycling at the leading and training edges of the dots and dashes (a phenomenon which does not disturb the tone generator, but which produces some unbelievable code-speed indications). Since the highest cycling rate for the unit is given by the decoder frequency divided by 20, and since for practical purposes the highest code speed is about twice this value (in terms of dots and dashes, not in terms of bauds), the values shown may be a bit low for those who listen to lower-speed code in the main. Static, which is random in tone and hence sometimes is in the passband of the decoder, may activate both the tone generator and the counter. Experimenting with values for C2 (and adjusting C3 accordingly) can overcome this at some loss of tracking at the very highest speeds. The feedback capacitor should also be enlarged in such cases.

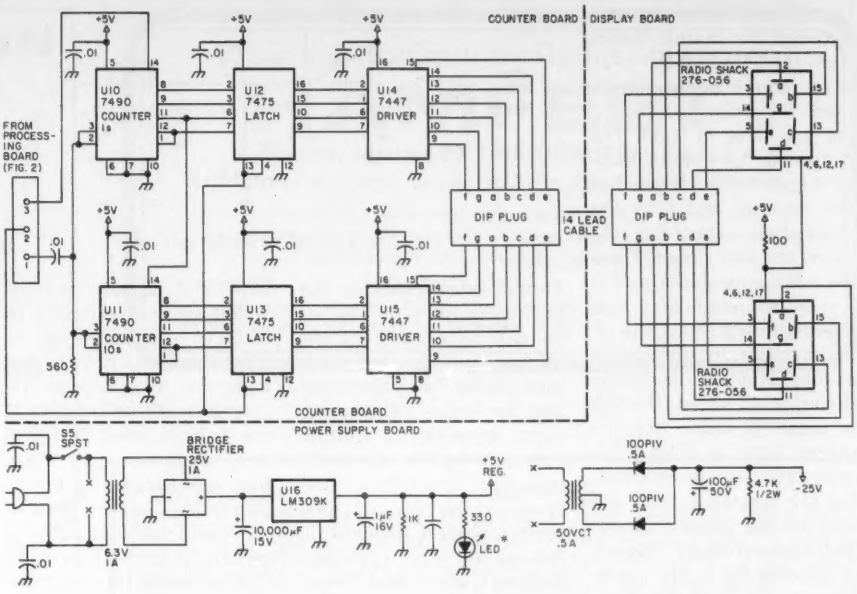


*Fig. 3. Counter, display, and power supply sections of CRASH.*

A single 7414 chip provides all the inverters needed for the entire unit—with two left over. The 7414 inverters are Schmitt triggers which provide extremely sharp rise and fall slopes. About the only place they are essential is just preceding the pulser to sharpen the rectified audio into a good digital pulse to key the pulser cleanly. The two inverters feeding pin 4 of the tone generator could have been combined into a NAND gate (¼ of a 7400) as shown in Fig. 4, with the remaining sections used as inverters by tying together their inputs. This would have saved the use of diodes and the 1k ground-return resistor. Either system should work well.

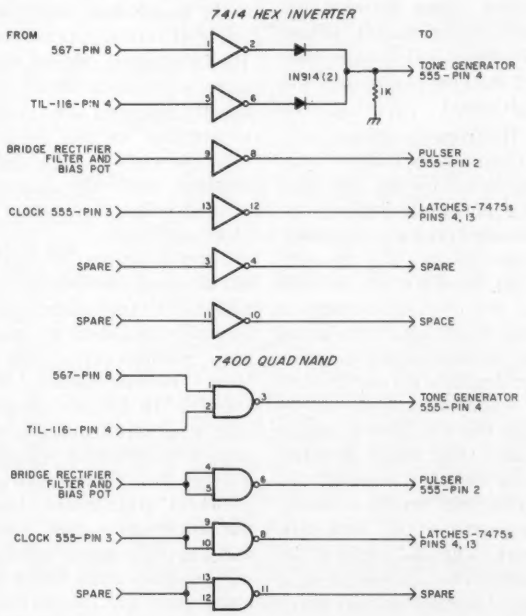


*Fig. 4. Using a 7400 in place of the 7414.*

All of the 555s are used in standard ways as either monostable timers or as astable oscillators. Among the monostables are the relay drivers. The first has a variable time period of .1 to 5 seconds, which is controlled from the front panel. The second is fixed at 2 seconds. This system is more reliable than the original, which used a large capacitor across the coil of the relay. The value of the requisite capacitor will vary according to the coil characteristics; the present system makes the delay in opening the speaker to receiver audio independent of the re-

lay. The 300-Ohm resistor between the output diodes from the 555s and the relay may require some adjustment depending on the relay you have in hand. The Auto switch is a spring loaded toggle which shorts out the resistors and keys the relay when a signal has activated the first driver. Since the voltage needed to pull in a relay is greater than that needed to hold it in, the relay remains in the circuit as long as either one of the drivers is activated. The 555 is triggered faster than its output falls, so there is no noticeable voltage drop during the transition from the first to the second driver. The Manual switch allows you to hold in the relay independently of the Auto circuit.

The other monostable 555 is the pulser whose 10-millisecond pulses permit tracking of CW to a very high speed.

The tone generator is a standard audio range astable circuit for the 555. Volume and tone controls are provided on the front panel. With the values shown, tones from 200 Hz to 3000 Hz are available. Contrast this circuit, where the wave has nearly equal positive and negative halves (or nearly equal on and off times), with the clock 555, which places the large resistor value between Vcc and pin 7. Here the "on" time is very long and the "off" time very short. The 4.7-second on time can be adjusted using a digital stopwatch (averaging several tries) or by allowing the counter to show the speed of a known transmission, such as a timed code-practice session. The 1-meg pot shown should be a miniature trimmer with 10 to 15 turns; otherwise, the adjustment will be very tricky. The .01 capacitor from the clock to the 7490s provides a count-clearing pulse that drops again through the resistor to permit gathering a new count.

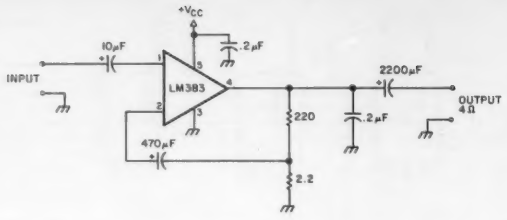


*Fig. 5. An alternative audio amplifier.*

The inverter provides the positive pulse to the latches to clear their old count and take on a new one for display. At the 7-segment readout, the single 100-Ohm resistor provides a simple means of lighting the units; however, brightness will vary depending on how many segments are lit simultaneously. For constant brilliance, use a 300-Ohm resistor in each lettered leg and omit the 100-Ohm unit in the supply line. Note that the lead zero is suppressed. The schematic shows the units in reverse order of visual indication—be sure to get the tens unit on the left. For common cathode displays, use 7448s instead of the 7447s and reverse the supply voltage.

Supplementing the basic circuit are a number of features. The optoisolator/coupler permits use of the unit as a code-practice oscillator. The internal LED of the TIL-116 (or just about any other available similar unit) is fed negative voltage through a multi-turn pot trigger-level adjustment. Use the minimum current that will key the output transistor cleanly, since there is little load on the circuit. The 47-Ohm resistor between the pot and the TIL-116 is a safety feature limiting the maximum current the LED can draw.

The LM386 is an extremely easy chip to use as an amplifier. It provides about a quarter Watt of power at 5 volts, far more than enough for a single CW tone. The 1-uF capacitors at the input make triangles out of the 555 square waves: Under load, these bend into hybrid sine and square waves, which are very pleasant to listen to for long periods of CW. The series resistor and capacitor to ground in the output might be omitted at the risk of what National Semiconductor calls "bottom side fuzzies," a distortion to the negative peak of the waveform. I was able to produce this effect easily, so I recommend retaining this simple insurance of good reproduction. If you desire more power, Fig. 5 shows an alternative amplifier using the LM383. This one will fill an auditorium with sound if your speaker is big and good enough.

The transformer and bridge circuit are miniature parts, the transformer being a reversed transistor output unit for driving speakers. The diodes (like all others, except in the power supply) are 1N914 equivalents. One uF should work as the filter, but you might wish to verify first that the inverter swings cleanly and that the counter gives accurate readouts. The bias pot, another multi-turn unit, should be set for about .8 volts. More precisely, adjust it for a level that permits audio signals of moderate level to cleanly swing the inverter.

Switching within the unit may look complex, but actually is straightforward. The TX-CPO 4-pole, 2-position rotary changes several things at once. The speaker audio reaches the decoder in the TX position. In the CPO mode, the amplifier (LM386) output is switched to the speaker rather than allowing the relay to control it as in the TX mode. The key is switched from the TIL-116 circuit (CPO) to the transmitter (TX). Finally, a pair of LEDs are switched to indicate the mode. Other switches are the two relay driver control switches, a DPDT toggle to place the audio input into the bridge and counter circuit (with LEDs to indicate what is being counted), and the power switch. One other LED appears in the decoder circuit to give a visual indication of tone-decoder signal lock and the code being received.

The power supply is normal in every respect, with an LM309K regulator in the +5-volt line. Note the heavy filtering in this supply to suppress hum. Those who work with digital circuits are accustomed to using about 3000 uF in such circuits, but audio requirements are much more stringent. The negative supply is unregulated and uses a small transformer from the junk box. Since its only function is to provide voltage and current to the optoisolater/coupler, not much of either is needed and any small transformer from 15 volts up will work. Although the LED in the TIL-116 requires only about 1.7 volts, the higher initial voltage provides room for adjustment of LED current to the lowest level that will key well.

**Construction**

Duplication of CRASH exactly as shown is a fairly straightforward task, but it may not be the best way for you to go. Many of the circuits can be replaced with others you prefer, and as long as each works at TTL levels, substitution should present few problems. Many extra features can be built into the unit to serve your CW needs, so before building, try modifying the design to fit your desires. After all, this is how CRASH happened in the first place—by a combination and adaption of ideas used by WB4TYL and K3BYM. The odds are



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Construction of the CRASH unit is a matter of taste. All will fit in a Radio Shack 9" by 5" by 6" cabinet, as the photo shows. Fig. 6 shows a sketch of a layout for inside the cabinet, while Fig. 7 suggests some board layouts by reference to the ICs. Although the prototype was built around two boards—one for processing, the other for the counter—I recommend using three. The processing board is overcrowded after circuit modification and adjustment.

Radio Shack digital experimenter boards (#276-156) for use with edge connectors (#276-1551) make convenient bases for the components, and Fig. 7 is drawn with these boards in mind. The counter board contains the 7490s, the 7475s, and the 7447s lined up in rows as in the schematic. The ouputs to the display board use a 14-line DIP connector set. A slightly larger set would permit running the power and ground connections as well.

The processing board should contain the 567 decoder, the 7414 inverter chip, the 555 pulser, the 555 clock, the transformer and bridge circuit, and the TIL-116 optoisolators. A separate audio board should contain the 555 tone generator, the 386 amplifier, and the two 555 relay drivers, along with the relay. The three boards might be mounted vertically in the case. The power supply is built on perfboard and mounted on standoffs at the bottom of the case for good weight balance. The display board also uses perf material and is held to the front panel by standoffs attached to the lugs on the bezel for the readout. Since most bezels are large enough for up to six digits and we only need two for this project, indicator LEDs (six of them) are mounted on the display board against a black foam background. This minimizes panel work and makes an effective blackout display when power is off.

Since the photo of the front of the unit was taken before the addition of the lettering, the panel control knobs are as follows, from left to right: decoder frequency, relay delay, TX-CPO switch, regenerator tone, and regenerator volume. The toggle switches along the bottom of the panel are, also left to right, ac power, auto relay, manual relay, and audio-oscillator counting. Were I to build a second version of this unit, about the only change I would make is to add a 2:1 or 3:1 vernier to the decoder frequency control, since tuning is just a bit tight at higher audio frequencies.

Because the unit mixes digital and audio functions, it is easy to slip into digital habits and ignore the fact that ground loops and hum pickup are potential problems in layout. Besides using a high level of filtering in the +5-volt supply, some extra precautions will minimize problems. Use short ground leads and attempt to ground all parts of each circuit to a common pad or small area. Group the main audio circuits together especially the 555 tone generator and the 386 audio amplifier. Use shielded leads from input and output terminals to the boards, and between boards, for all audio lines. On each board, run a 47-uF or 100-uF electrolytic to ground at the power entry point and bypass each chip with at least a .01-uF disc ceramic capacitor.

Since you will be using the unit in the presence of your transmitter and with the keyline running into the unit, good rf practice is also essential. Bypass both ac lines where they enter the case with .01-uF disc ceramic (1000-volt units, which are getting harder to find at discount prices). Also bypass the key jack and the transmitter jack with .01 units. Since rf can instantly disable many ICs, especially at transmitter leakage power levels, the more bypassing, the better. It should not affect dc levels in the keying circuits. When you develop your own layout, be generous in this department. If in doubt, bypass it. Finally, be sure the case is at dc ground potential. Some of the anodized cases make it difficult to get a good ground contact, so be sure to use a good tooth washer at contact points.

Since this is a one-of-a-kind unit, I regret that no circuit boards are available. However, The Radio Shack epoxy experimenter boards are fun to use, and where perfboard is recommended, the wiring is easy and straightforward. The toughest problem will be to have patience during construction.

When you build the unit (if you do build one), I recommend one of two procedures. Either build the unit a stage at a time, or at least omit the power lead to every chip until it is time to check out the circuit. The first step, as in all projects, is to build and test power supplies. Once these are ready, we can work progressively through the rest of the stages.

A good place to start is with the counter board, which can be built complete, along with the seven segments of the display board. Since there are few components besides jumpers between ICs, visual inspection should prepare you for testing under power. Next, verify the clock 555 as operating by checking its output (and the output from its inverter section) with a VTVM. If all is well, connect to the counter board. Only the right (ones) digit should light and show zero (although there may be a spurious count when power is applied). For test purposes, you can key 5 volts through a resistor (say 1k) to the counter input to verify counting. If all is well, time the counter with a stopwatch. An easy way to check periods is to tap the key a few times so that the count changes at the end of the period. The

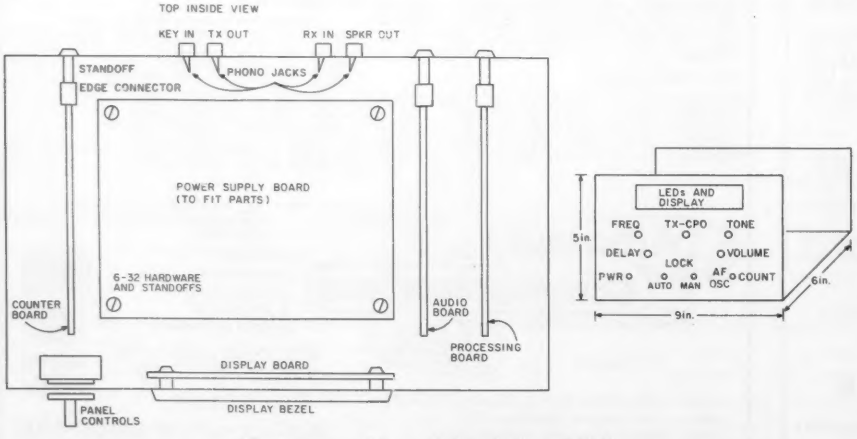


*Fig. 6. General layout sketch for CRASH.*

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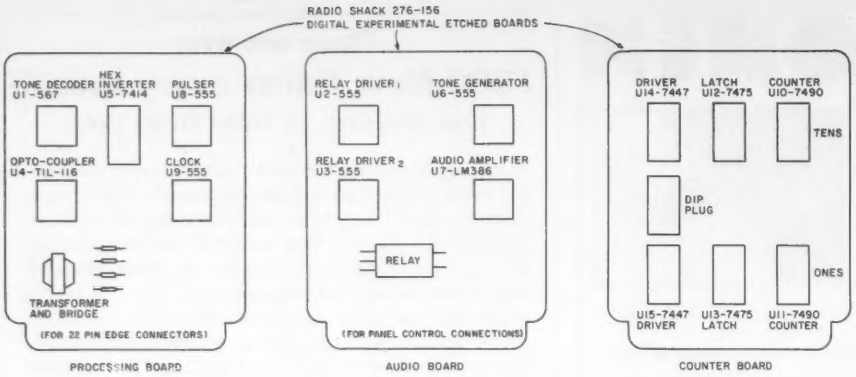


*Fig. 7. Suggested board layouts for CRASH.*

target for reasonably accurate code-speed readouts is 4.8 seconds per total cycle.

The next step is to verify the 555 tone generator. In the absence of the tone decoder and TIL-116 keyer, key the tone generator by applying +5 volts to pin 4. When you are satisfied with its volume and tone ranges, add the 386 amplifier. If you have a scope, you can check the waveform and adjust the capacitor network between the 555 and the 386 to suit your taste. The 555 can overdrive the 386, so check the output with a scope if you can. Adjust the coupling capacitor (shown as .02 uF in the schematic) so that the waveform just begins to flatten at full volume.

At this point, you can move in several directions according to your preference. Now is a good time to wire the TX-CPO switch and adjust the TIL-116 optoisolator/coupler. Begin with maximum resistance on the 20k multi-turn pot and reduce the resistance until pin 4 of the TIL-116 shows clean keying without hanging, as indicated by a VTVM. The object here is to get clean keying of the tone generator with minimum current to the LED. Since the inverter requires little current from the phototransistor output of the TIL-116, there is little need to overdrive the system.

We can now count our own code speed as we key the optocoupler, since the inverter which keys the pulser is driven. Adjust the bias 10k multi-turn pot until the output of the inverter (pin 9) also shows clean keying without hanging, as indicated on a VTVM. About .8 volts of bias will suffice, and we will readjust this control in a moment. For now, we should see our code-speed readout on the seven-segment displays every 4.8 seconds. To be sure that counting is good, key the unit a known number of times (that is, 2 to 12 or so dots) within a counting period and wait for the readout to correspond. In this way, we can check that the counter and pulser are giving us proper performance.

At this point, wire the AF-OSC switch and the input to the transformer. The OSC position is blank, since the incoming count connection is made directly to the pulser's inverter. Audio from the speaker, however, goes directly to the transformer through the switch to count the sidetone oscillator during transmit periods or to count received signals when the band is clear. An audio generator with a few volts output at low impedance will aid you to readjust the bias 10k pot so that the keying is clean. Weak signals may not push the voltage to the inverter high enough to trigger the inverter, but once connected to the receiver, the sidetone should key the counter easily. You may want to tweak this adjustment later when the unit is connected to the station rig.

We have saved the tone decoder 567 for last. Using the audio generator so that the 567 has about .2 volts at its input and with the TX-CPO switch in the TX position, locate and lock the audio signal with the frequency control. 700 to 900 Hz should put the control about midrange using the series-parallel resistor combination given. If you key the audio line, the tone generator should follow without delay and the count should be accurate. If the count goes very high, even at slow keying, you probably are experiencing chatter and may want to increase the feedback capacitor between pins 8 and 1 from the 1-uF value shown. The LED from Vcc to pin 8 should also track the keying.

Assuming that all is well to this point, check the unit with on-the-air signals on a fairly clear band. If the 567 responds too readily to noise (anything from QRN to internal receiver pops), you may want to increase the values of the capacitors at pins 2 and 1 of the 567, remembering to keep the larger about twice the value of the smaller. This will slow down the response of 567. We cannot eliminate all response to noise without cutting off higher speed CW, but we can find values that will keep the counts fairly accurate and eliminate hash from the keying of the tone generator.

At this point, the CRASH unit should be operational and ready for dial decals, case covering, and regular use in the shack.

### Operation and Modification of CRASH

Operating CRASH is simple but requires some adjustment of your habits. When receiving CW, find the desired signal with the frequency control. The LED will track the code when the signal is in the passband of the 567. If the signal drifts, it is probably better to ignore the regenerator and concentrate on the station. Stable signals, however, will stay in the passband. Once the signal is acquired, use either the auto or the manual toggles to switch to the regenerator.

Since CW without QRM and QRN sounds strange at first, you may initially dislike the effect. Part of learning to like clear reception is choosing tone and volume settings that please your ears. You may find that you prefer a lower volume than with received signals, and the tone you choose may be something different from where you usually tune signals in the receiver passband. Experimenting with signals on relatively clear bands is the best way to match the unit to your preferences.

Although the 567 tone decoder accepts a wide range of input levels, receiver characteristics limit the useful range. Weak signals beyond the receiver agc limit can fade below the 567's ability to lock, and excessive volume may be accompanied by enough noise pulses to hold in the relay continuously, even without a signal. The level control can be adjusted to provide the 567 with input voltages tailored to your own habits with the receiver volume control. However, you may have to adjust receiver volume to suit the 567 if you of-

ten move from noisy bands with high signal levels, like 80 meters, to quiet bands with weak signals, such as 15 meters in the evening. Considerable experience using the CRASH unit may be needed before you settle on the final compromise setting of the level pot.

Although the unit operates well as is, CRASH is a good project for trying out new ideas. For example, Fig. 8 shows the insertion of an amplifier to isolate the audio to the speaker from the inputs of the transformer and the 567. Any amplifier which limits the voltage at the output in a controllable way should work here. Fig. 8 also shows an extra transistor in the relay circuit, in case you wish to drive relays of other than 5 volts, or in case you want to drive a heavier load.

In addition to these options, which have been tried but are not used in this version, the CRASH unit provides possibilities for external connections. Since the 567 bandwidth is narrow and its output is digital, the unit can also be used to key other devices. Fig. 8 shows inverters as buffers to other devices, such as a MORSE-ASCII converter system for television or a computer readout of the CW. How you do this is open to many options, and a system is under development here for driving a TRS-80 III. Once you have brought the unit this far, then computer keying, automatic logging, and other station conveniences are only a dream and a soldering iron away.

In short, the CRASH unit not only works well as a CW regenerator and code speedometer, but it also forms the basis for a number of other station options. But that is the way it usually goes with ham projects: One thing leads to another and nothing is ever finished for good. There is no telling what a good CRASH will lead to next. ■

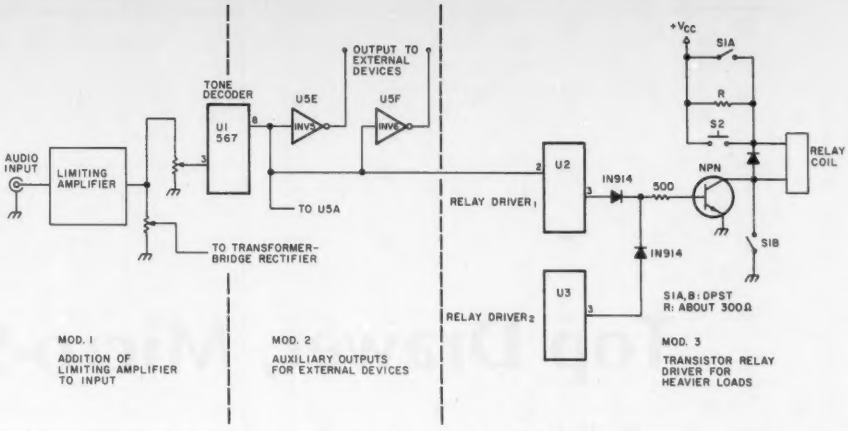


*Fig. 8. Some modifications to CRASH.*


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# Top Drawer, Micro-Style

*Building circuits is fun, but drawing them isn't. Let your Apple do your drafting.*

*Bill Smith K3LF*
*RD 2, Cold Spring Creamery Rd.*
*Doylestown PA 18901*

Using a microcomputer to assist in designing circuits is a natural. I recognized this shortly after acquiring my Apple computer and proceeded to build a library of electronic-design programs. My library covers such things as audio filters, timers, multivibrators, and many op-amp circuits. Most of the programs were entered from magazine articles such as those found in back issues of *73*. These programs are a real asset when designing or trying to "ballpark" component sizes for a particular application.

As helpful as these programs are, they have one major weakness: They have no way of displaying the circuit diagram. To make matters worse, they usually refer to components as "R1" or "C3." To find out where "C3" is located in the circuit, you have to find the article from which you entered the program and hope that the author included a circuit diagram with all of the components labeled correctly. If you are like me, you will probably find that you lent that particular magazine to a friend who just left town for a sabbatical in South America!

Well, hang on, help is on the way. This article describes how you can incorporate that schematic diagram within your program so that it will be available at the touch of a button.

I have devised a system that uses the excellent HIRES capability of the Apple II to your best advantage. I decided that the system to be used should be fairly easy to implement; I did not want to spend hours entering a diagram for each program. I needed a system that would be flexible so that I could enter all types of electrical schematics, not just one unique circuit. Lastly, the system had to allow me to enter fairly complex circuits.

With all of these points in mind, I embarked on a six-month project to develop the system described here. I call it my "EGG" (Electronic Graphics Generator), and it really works.

The EGG is nothing more than a shapefile with up to 200 shapes and a system to map the shapes onto the HIRES screens. (Currently there are 135 shapes in the shapefile but I have set up the file to handle up to 200 for any future expansion.) The first 59 shapes are characters generated by the Apple's text generator. These shapes are used for labeling circuits and components and for any text desired on the HIRES screen with the circuit diagram. Shapes 60 through 65 are Greek letters common to electrical diagrams (such as lambda for wavelength), 66 through 99 are the actual electrical components, and the remaining shapes are used for connecting the components and drawing rectangles representing ICs.

The Apple HIRES screen dimensions are 280 points horizontal by 192 points vertical. I used these dimensions to determine the optimum size for each shape in my shapefile. Each shape is drawn within a grid that is 15 ×15 with the origin of the shape located at the center of this grid. Using these dimensions, I could accommodate 18 shapes horizontally and 12 shapes vertically for a total of 216 shapes

*Fig. 1. Schematic of an active audio filter as it would appear within a program. This is typical of the type of schematic which may be incorporated in your programs.*

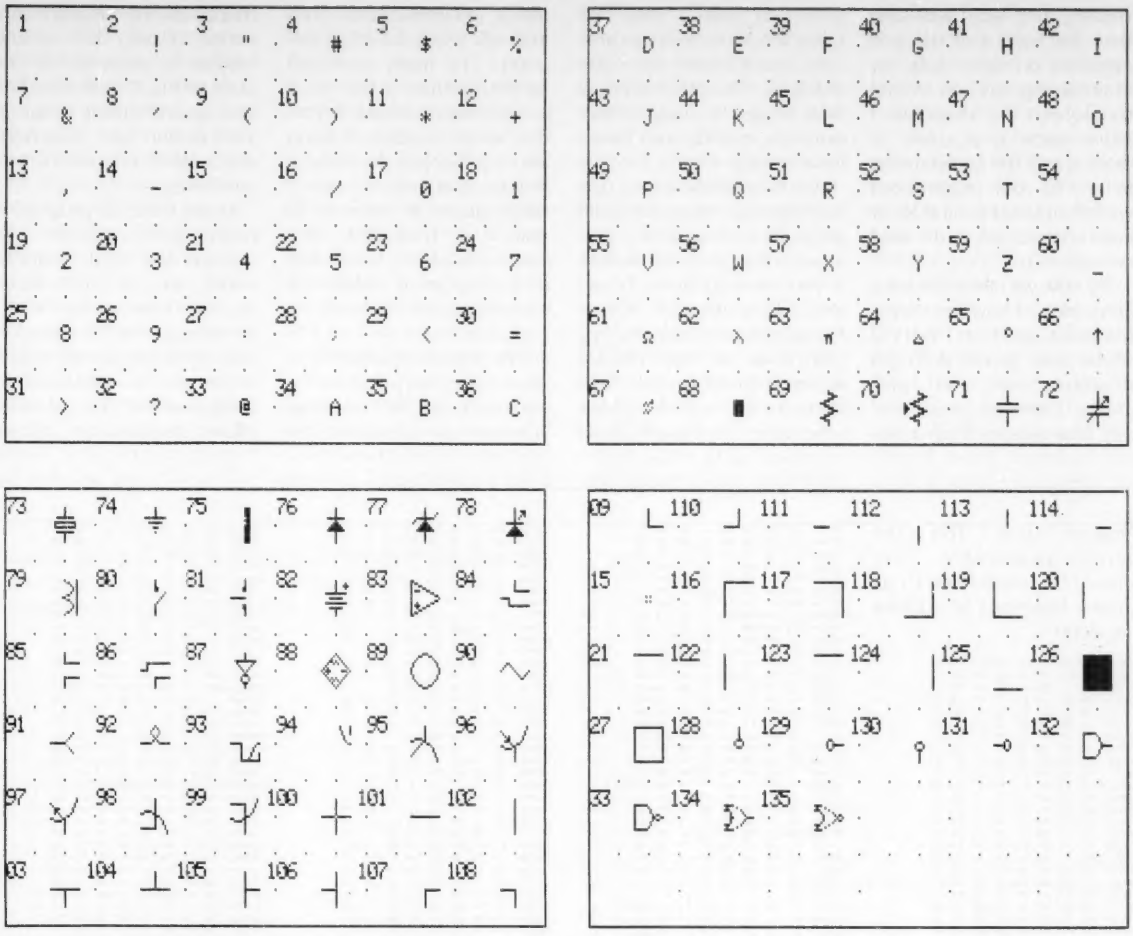

*Table 1. These are the shapes in the shapefile along with their respective shapenumbers. You may add an additional sixty-five shapes to the file if you can think of any to add.*

on each screen. With two HIRES screens available, I could have up to 432 components in my circuit, more than enough.

Practically speaking, the number of components you will be able to fit on the screen will be much less as labels and connecting lines take up some space. To date, the largest diagram I have used contained 28 components and it easily fit onto one screen. With a little effort you should be able to get as many as 50 components on a screen and still have them labeled properly. Fig. 1 is an active audio filter which I recently used in a program. As you can see, this is a moderately complex circuit but it fits on the screen well and all of the components are easily recognizable.

As mentioned, the shapes are all centered in a square measuring 15 spaces times 15 spaces. This is an important point and I want to explain it in more detail. If you examine shape 76, a standard diode, you will notice that the leads are centered on the 15×15 grid. I have enlarged this in Fig. 2 so it may be seen more readily. You will find that all of the components have their leads exiting on a center line, either horizontal or vertical. If I draw two of shape 76 and each is rotated 90 degrees, with one centered 15 spaces above the other, the leads will appear to connect as shown in Fig. 2. Having the origin of all of the shapes located in the center allows us to use the ROT (rotate) command so that we can draw the diode as

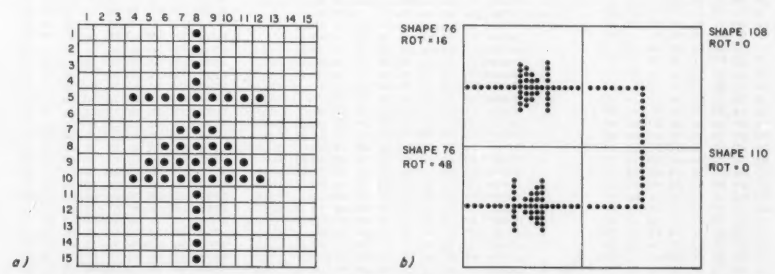


*Fig. 2.(a) Shape #76 as it would appear under a magnifying glass. (b) This drawing shows how the shapes are rotated and combined to form schematics.*

shown, and you will find that the leads exit the grid centered on either side. By maintaining this convention throughout the shapefile, I have made it possible to draw any of the components in any of four orientations with their leads available for easy connection to the next component.

By now you should have a good idea of how the shapefile is set up. Next, I will describe how to use it to get diagrams into your programs. There are two methods. One is quick from a programming point of view but takes longer to execute and uses more room on your diskettes. The other takes a little longer to program but executes quickly and takes little storage room.

The first method is to use the schematic draw-and-edit program accompanying this article. This program makes it very easy to draw, label, and edit a diagram. Once the diagram is drawn, the entire map of the HIRES screen is saved to disk. This method is quick. (The schematic in Fig. 1 took about ten minutes to draw and edit using the EGG program.) The main drawback to this method is that each screen must be loaded from disk when needed. It takes about 34 sectors to store this much information, and it takes about 8 seconds to read it in from disk. This 8-second delay in the middle of a program is mildly disconcerting but certainly acceptable.

The second method is to enter into your program the necessary BASIC language statements to draw the shapes during program execution. Using this second method to generate the diagram of Fig. 1 took less than one second during program execution but requires about thirty minutes of programming.

Using the EGG program is really quite easy as it is menu-driven and contains many useful edit commands. There are two levels of menus. The first level is used to select which HIRES screen you are interested in using and the second level allows selection of various

*Program listing 1. This is the actual shapetable. This should be entered exactly as shown beginning at address hex 8000.*

```
8000- 82 00 92 01 94 01 9B 01
8008- A2 01 B5 01 C5 01 D2 01
8010- E3 01 EB 01 F5 01 FF 01
8018- 0A 02 12 02 16 02 1B 02
8020- 1E 02 27 02 36 02 3E 02
8028- 4B 02 5B 02 63 02 73 02
8030- 82 02 8E 02 9B 02 A6 02
8038- A9 02 AD 02 B8 02 C0 02
8040- CB 02 D5 02 E5 02 F2 02
8048- FE 02 0B 03 17 03 23 03
8050- 2F 03 3C 03 49 03 52 03
8058- 5C 03 6B 03 75 03 81 03
8060- 8F 03 9E 03 A9 03 B6 03
8068- C4 03 D2 03 DA 03 E8 03
8070- F7 03 03 04 0F 04 1B 04
8078- 29 04 2F 04 3B 04 4A 04
8080- 53 04 5D 04 66 04 70 04
8088- 7D 04 93 04 B1 04 DD 04
8090- FA 04 2A 05 54 05 6F 05
8098- 8F 05 B4 05 DF 05 0F 06
80A0- 2B 06 3F 06 53 06 7F 06
80A8- A2 06 BA 06 CF 06 EA 06
80B0- 0F 07 45 07 68 07 79 07
80B8- 8B 07 A6 07 BE 07 D1 07
80C0- F1 07 18 08 3C 08 59 08
80C8- 80 08 97 08 A2 08 B1 08
80D0- C6 08 D7 08 EC 08 01 09
80D8- 0C 09 17 09 26 09 35 09
80E0- 3A 09 3F 09 47 09 4C 09
80E8- 53 09 6D 09 82 09 9B 09
80F0- B4 09 C6 09 D9 09 E7 09
80F8- FA 09 0C 0A 1A 0A 92 0A
8100- B7 0A C5 0A D2 0A DF 0A
8108- EC 0A DF 0A 00 00 00 00
8110- 00 00 00 00 00 00 00 00
8118- 00 00 00 00 00 00 00 00
8120- 00 00 00 00 00 00 00 00
8128- 00 00 00 00 00 00 00 00
8130- 00 00 00 00 00 00 00 00
8138- 00 00 00 00 00 00 00 00
8140- 00 00 00 00 00 00 00 00
8148- 00 00 00 00 00 00 00 00
8150- 00 00 00 00 00 00 00 00
8158- 00 00 00 00 00 00 00 00
8160- 00 00 00 00 00 00 00 00
8168- 00 00 00 00 00 00 00 00
8170- 00 00 00 00 00 00 00 00
8178- 00 00 00 00 00 00 00 00
8180- 00 00 00 00 00 00 00 00
8188- 00 00 00 00 00 00 00 00
8190- 00 00 00 00 00 18 38 36
8198- B6 04 00 0B 1B 1B 36 0D
81A0- 24 04 00 0B 1B 1B 36 36
81A8- 36 0D 24 24 24 95 1F 1F
81B0- 16 0D 0D 04 00 09 0B 1B
81B8- 3F BF 0E 2D D5 F1 3F 77
81C0- 21 20 20 20 00 0B 1B 1B
81C8- 37 6D F1 1E 1E 1E 4D 35
81D0- 27 00 09 16 0F 1B 0F 1B
81D8- 0F 1B 0F 1B 64 15 B6 1B
81E0- 76 25 00 09 1B 0B 1B 1E
81E8- 1E 04 00 64 0C 96 92 0F
81F0- 1E 0F 1B 04 00 E4 1C 96
81F8- 92 0D 1B 0D 1B 04 00 24
8200- 95 0D 1B 16 1F FE 20 AB
8208- 04 00 24 96 6E 0B 1B FF
8210- 27 00 32 1E 04 00 2B 2D
8218- DF 23 00 92 04 00 0B 1B
8220- 48 F6 1E 1E 1E 26 00 0C
8228- 0C 1C 3F 17 36 2E 1E 0E
8230- 2D 0D 1B 24 24 0B 1B 60
8238- 36 36 AE 3F 04 00 0B DB
8240- 63 2D 15 F6 1E 1E 1E 2D
8248- 2D 04 00 0C DB 63 2D 15
8250- F6 0E F6 3F 0F 1B 04 00
8258- 4A D6 24 24 24 1E 1E 1E
8260- 2E 25 00 09 0B 1B 3B 3F
8268- 37 2E 2D 15 36 1E 3F 0F
8270- 1B 04 00 09 0B 1B 1B BF
8278- 1E 2E 2D 15 F6 3F 0F 1B
8280- 24 00 1B 0B 1B 2C 2D 35
8288- 1E 1E 1E 1E 26 00 3F 20
8290- 0C 2D 15 F6 0E F6 3F 0F
8298- 1B 24 00 39 3F 20 0C 2D
82A0- 15 36 F6 1E 27 00 B0 04
82A8- 00 B0 1E 04 00 09 0B 1B
82B0- B0 17 17 0E 0E 0E 04 00
82B8- 1B 2B 2D B5 3F 3F 04 00
82C0- 1B 0B 1B 70 0E 0E 1E 1E
82C8- 1E 04 00 00 D8 63 2D 15
82D0- F6 1E 16 04 00 52 09 1B
82D8- 24 E4 3F 17 36 36 0E 2D
82E0- E5 3B 24 25 00 2D 36 FE
82E8- 1B 24 2C 1C 0C 0C 15 15
82F0- 04 00 3F 24 2C 2D 15 F6
82F8- 0E F6 3F 27 24 00 0B 5B
8300- E1 3F 17 36 36 0E 2D 0D
8308- 1B 04 00 1B 24 2C AD 15
8310- 36 1E 1E 3F 24 04 00 FD
8318- 27 24 2D 2D 96 92 3F 3F
8320- 24 04 00 39 27 0B 5B 09
8328- 3F 3F 36 36 36 04 00 CA
8330- 2D F6 3F 0F 18 24 24 0C
8338- 2D 15 04 00 2B 25 0B 5B
8340- 36 36 36 DF 23 24 24 24
8348- 00 24 3C 0D 96 1A 36 FD
8350- 04 00 0B 1B 2B F5 36 36
8358- 1E 3F 2B 00 0B 1B DB 36
8360- 36 36 4D 39 3B 3B 60 0C
8368- 0C 04 00 0B 1B DB 36 36
8370- 36 2D 2D 04 00 64 0C 36
8378- 36 36 DF 23 24 24 AC 04
8380- 00 92 1B 24 24 24 95 0E
8388- 0E 56 24 24 24 04 00 0B
8390- 1B 3B 17 36 36 0E 2D 0D
8398- 1B 24 24 1C 04 00 92 1B
83A0- 24 24 24 2D AD F6 3F 04
83A8- 00 4A 24 E4 3F 17 36 36
83B0- 0E 6D 1C 1C 04 00 92 1B
83B8- 24 24 24 2D AD F6 3F 0E
83C0- 0E 0E 04 00 0B 5B E1 3F
83C8- 17 76 2D 15 F6 3F 0F 1B
83D0- 04 00 92 24 24 24 2D DF
83D8- 27 00 0B 1B 0B DB 36 36
83E0- 76 2D 0D 1B 24 24 24 00
83E8- 0B 1B DB 36 36 0E 0E 0D
83F0- 1B 0D 1B 24 24 04 00 76
83F8- 0E 24 24 24 DF 33 36 36
8400- 2E 2D 00 1C 1C 6C 09 F6
8408- 16 0E FE 1B 64 04 00 36
8410- 3E 0B 1B 0B 1B 1C 6C 09
8418- F6 04 00 2B 25 DB 0B 1B
8420- 2D 2D F6 D6 F3 2E 2D 25
8428- 00 92 9B 2D 2D 04 00 9B
8430- 12 2D 1B 1C 64 2D 15 F6
8438- 2E 04 00 92 1B 64 0C 0E
8440- 0E 26 0B 1B 0B 9B DB 1C
8448- 04 00 33 36 0D 24 64 9F
8450- 1F 04 00 92 2D 5C 1C 1C
8458- 1E 0E 2E 04 00 0B 1B 2B
8460- 15 F6 3F 2D 04 00 92 24
8468- 24 24 15 15 DF 63 04 00
8470- 1B 60 0E 0C 25 8E 13 1E
8478- 1E 1C 1E 04 00 0B 1B DB
8480- 36 36 25 24 24 2C 36 36
8488- 36 36 25 24 24 2C 36 36
8490- 36 04 00 0B 1B 0B 1B 0B
8498- 1B 3B 2D 2E F5 3B 37 3F
84A0- 5E 3F 4E 2D 2E 35 2D DE
84A8- 3F 3E 37 3F 4E 2D 36 04
84B0- 00 0B 1B 0B 1B 0B 1B 3B
84B8- 2D 2E F5 3B 37 3F 3E 77
84C0- 29 35 2D 2E F5 3B 37 3F
84C8- 3E 77 29 35 FE DB 0B 1B
84D0- 0B 1B 0B 0E 0C 25 8E 13
84D8- F6 24 24 04 00 0B 1B 0B
84E0- 1B 0B 1B 3B 36 36 2D 2D
84E8- F5 DB 1B 3B 3F B7 2A 2D
84F0- 2D 2D 2D F5 DB 33 36 36
84F8- 04 00 0B 1B 0B 1B 0B 1B
8500- 3B 36 36 3E 3F 3F 4E 49
8508- 00 1B 24 2D 96 3F 3F 3F
8510- 3F 3F 4E 49 16 B4 FE DB
8518- 0B 1B 0C 0C 0C 58 61 0C
8520- 0B 0C 0C 0C 36 0F 1B 3B
8528- 04 00 0B 1B 0B 1B 90 12
8530- 2D 2D 35 3E 3F 3F 3F 3F
8538- 27 2C 2D 25 DB 2B 2D 2D
8540- 2D E5 DB 24 B4 92 92 12
8548- 2D 2D D5 DB 1B 3B 3F 4E
8550- 09 36 26 00 0B 1B 0B 1B
8558- 0B 1B 3B 36 2E 2D 2D DE
8560- DB 0B 1B 3F 3F 56 29 2D
8568- 2D B5 1B 3F 56 04 00 0B
8570- 1B 0B 1B 0B 1B 30 36 16
8578- 16 36 36 36 2E 24 24 0C
8580- 1B 24 24 24 24 35 36 36
8588- 36 36 77 36 36 04 00 0B
8590- 1B 0B 1B 0B 1B 30 36 2E
8598- 2D F5 DB 0B 1B 3F 77 49
85A0- 15 3F 17 2D 2D 15 3F 3F
85A8- 3F 17 2D 2D 2D 2D DE 1B
85B0- 36 36 04 00 0B 1B 0B 1B
85B8- 0B 1B 30 36 2E 2D 2D 2B
85C0- 00 DA DB 1B 3B 3F 17 17
85C8- 0D 4B 09 15 3F 17 2D 2D
85D0- 15 3F 3F 3F 17 2D 2D 2D
85D8- 2D DE 1B 36 36 04 00 0B
85E0- 1B 0B 1B 0B 1B 30 36 36
85E8- 2E 2D 25 DB 0B 1B 0B 1B
85F0- 0D 1B 3F 4E B6 D2 DB 1B
85F8- 3B 3F 4E 09 15 3F 17 2D
8600- 2D 15 3F 3F 3F 17 2D 2D
8608- 2D 2D DE 1B 36 04 00 2B
8610- 0E AD 15 F6 1E F7 4D 49
8618- 24 24 24 24 24 24 97
8620- 92 DA 1B 2D 2B 20 1C 1C
8628- E7 04 00 0B 1B 0B 1B 0B
8630- 1B 30 36 2E B4 49 F1 1E
8638- 1E 1E 36 36 04 00 3F
8640- 3F 3F 27 48 49 09 20 24
8648- BC 12 B6 92 32 0D 1B 36
8650- 36 04 00 0B 1B 0B 1B 4B
8658- 09 2D 1C 16 DF 0B 1B DB
8660- 36 36 2E 2D 2D DE DB 0B
8668- 1B 3F 3F 56 29 2D 2D 6D
8670- 12 3F 3F 3F 3F 3F 56 29
8678- 2D 2D F5 1B 36 04 00 09
8680- 49 39 3B 1C E7 E7 E7 E7
8688- E7 37 36 6E 2D D5 DB 33
8690- 36 36 0D 2D 1C 16 DF 36
8698- 2E 0D 1B 65 65 65 65 65
86A0- 25 00 0B 1B 0B 1B 0B 1B
86A8- 30 36 2E 2D 2D 2D 96 92
86B0- 3F 3F 3F 3F 3F 24 3C 3F
86B8- 27 00 0B 1B 0B 1B 0B 1B
86C0- 30 36 2E 2D 2D 2D 96 92
86C8- 3F 3F 3F 37 36 26 00 49
86D0- 49 09 1B 0B 1B 1B 3F 3F
86D8- 3F 3F 3F 37 36 3F B7 92
86E0- 52 49 49 24 24 2D 2D 2D
86E8- 25 00 0B 1B 0B 1B 0B 1B
86F0- 30 36 2D 2D F5 17 DF 0B
86F8- 1B 3B 3F 77 0E 0E 0E 0E
8700- 0D 1B 0D 1B 96 3B BF 76
8708- 2D 0D 1B B4 DA 26 00 49
8710- 2D 0D 1E 1E 1E 1E 1E 1E
8718- 1E 1C 1C 1C 1C 0D 0E 0D
8720- 1B 15 0C DB DB 1B 1C 1C
8728- 0C 0C 0C 96 2B F5 0C 1B
8730- 0C 1B 0B 0C 0C 0C 15 15
8738- 15 15 DF DB A8 0D 1B 15
8740- 4E 09 15 04 00 49 49 09
8748- 1B 36 1E F6 1E 1E F7 3F
8750- 0F 1B 0F 98 1C 1C 1C E4
8758- 24 0C 64 0C 0D 1B 0C 0D
8760- 1B 2D 15 75 0E 0E 26 00
8768- DB DB 63 0C 0C 0C 0E 0E
8770- 0E 0E 0E 0E 2D 2B 2B 2B
8778- 00 DB DB 9B 2D 2D 2D 2D
8780- 2B 2B 2B B8 92 DB 0E 0E
8788- 0E 04 00 DB DB 2B 2D 2D
8790- 0D 1B 0D 1B 0D 1B 0D 1B
8798- E4 1C 1E 1E 76 96 09 A8
87A0- 0E 5B 2D 2D 04 00 DB DB
87A8- 2B 2D 2D 36 36 36 2E 2D
87B0- 2D 2D 2D 24 24 0B 1B 3B
87B8- 1E 1E F6 F6 04 00 09 0B
87C0- 1B 0B 1B 0B 1B 30 0E AE
87C8- 76 0E 25 0B 1B 20 24 04
87D0- 00 20 24 24 BC 92 12 0F
87D8- 1B 3F BF 6F 49 D1 1E 1E
87E0- 1E 1E 1E 4D 49 09 0B 1B
87E8- 0B 1B 2B 15 15 AE AE 26
87F0- 00 32 36 36 36 04 00 09
87F8- 1B 0B 1B 17 3F 3F 3B 4D
8800- 09 3B 3B 3B 3B 3B B0 52
8808- 29 0C 58 6E 91 29 0D 1B
8810- 0D 1B 2C 20 0D 1B 24 00
8818- 32 36 36 3E 0B 1B 0B 1B
8820- 0B 1B 17 3F 3F 3B 4D 09
8828- 5B 1C 1C 1C 1C 1C 96 4A
8830- 64 6D 92 09 65 0C 2C 20
8838- 0D 1B 24 00 92 12 3F 3F
8840- 3F 67 49 49 24 24 24 24
8848- 24 BC 92 92 E0 3F BF 77
8850- 49 49 29 15 15 AE 76 26
8858- 00 DB DB 0B 1B 0B 1B 0B
8860- 1B 2D 2D 2D 35 36 36 36
8868- 36 36 3E 0B 1B 0B 1B 0B
8870- 1B 1E 3F 3F 3B 4C 49 49
8878- 2D 2B 20 0C 2C 20 04 00
8880- 24 24 24 FC DB 9B 92 92
8888- 2D 2D 2D 2D 2D 2D 2D DE
8890- DB 1B 36 36 36 04 00 49
8898- 49 39 3F 3F 3F 3F 3F 3F
88A0- 27 00 0B 1B 0B 1B 0B 1B
88A8- 30 36 36 36 36 36 36 26
88B0- 00 32 36 36 FE DB 1B 0B
88B8- 1B 0B 1B 0B 1B 2B 2D 2D
88C0- 2D 2D 2D 2D 25 00 20 24
88C8- 24 FC DB 9B 92 92 2D 2D
88D0- 2D 2D 2D 2D 04 00 29
88D8- 2D 2D E5 DB DB 0B 1B 0B
88E0- 1B 0B 1B 36 36 36 36 36
88E8- 36 36 04 00 3B 3F 3F 27
88F0- 0B 1B 0B 1B 0B 58 49 49
88F8- 36 36 36 36 36 36 36 04
8900- 00 49 49 39 3F 3F 3F 36
8908- 36 36 26 00 92 92 22 24
8910- 24 24 3F 3F 3F 27 00 0B
8918- 1B 0B 1B 36 36 36 36 36
8920- 36 2D 2D 2D 25 00 0B 1B
8928- 0B 1B 0B 1B 30 36 36 36
8930- 3F 3F 3F 27 00 3F 3F 3F
8938- 27 00 36 36 36 26 00 20
8940- 24 24 B4 92 12 04 00 2D
8948- 2D 2D 25 00 0B 16 1F 0C
8950- 1B 04 00 49 49 09 1B 0B
8958- 1B 0B 1B 0B 1B 3F 3F 3F
8960- 3F 3F 3F 36 36 36 36 36
8968- 36 36 36 04 00 92 92 5A
8970- 49 49 21 24 24 24 24 24
8978- 24 3C 3F 3F 3F 3F 3F 3F
8980- 27 00 0B 1B 0B 1B 0B 1B
8988- 48 49 09 36 36 36 36 36
8990- 36 36 3F 3F 3F 3F 3F 3F
8998- 3F 04 00 0B 1B 0B 1B 0B
89A0- 1B DB DB 1B 36 36 36 36
89A8- 36 36 36 2D 2D 2D 2D 2D
89B0- 2D 2D 04 00 0B 1B 0B 1B
89B8- 0B 1B 0B DB 1B 36 36 36
89C0- 36 36 36 36 04 00 DB DB
89C8- 0B 1B 0B 1B 0B 1B 0B 1B
89D0- 2D 2D 2D 2D 2D 2D 2D 04
89D8- 00 DB DB 93 92 12 24 24
89E0- 24 24 24 24 24 04 00 DB
89E8- DB 0B 1B 0B 1B 0B 1B 0B
89F0- 1B 2D 2D 2D 2D 2D 2D 2D
89F8- 04 00 0B 1B 0B 1B 0B 1B
8A00- 48 49 09 36 36 36 36 36
8A08- 36 36 04 00 49 49 91 92
8A10- 12 3F 3F 3F 3F 3F 3F 3F
8A18- 04 00 92 92 DA DB 1B 2D
8A20- 2D 2D 2D 2D 2D 2D 5C 3F
8A28- 3F 3F 3F 3F 3F 3F 2C 2D
8A30- 2D 2D 2D 2D 2D E5 FD 3F
8A38- 3F 3F 3F 3F 3F 2C 2D 2D
8A40- 2D 2D 2D 2D 25 3F 3F 3F
8A48- 3F 3F 3F 3F 2C 2D 2D 2D
8A50- 2D 2D 2D 25 3F 3F 3F 3F
8A58- 3F 3F 3F 2C 2D 2D 2D 2D
8A60- 2D 2D 25 3F 3F 3F 3F 3F
8A68- 3F 3F 2C 2D 2D 2D 2D 2D
8A70- 2D 25 3F 3F 3F 3F 3F 3F
8A78- 3F 2C 2D 2D 2D 2D 2D 2D
8A80- 25 3F 3F 3F 3F 3F 1F 3F
8A88- 4D 2F 2B 2D 2D 2D 2D 2D
8A90- 2D 25 00 0B 1B 0B 1B 0B
8A98- 1B 2B 2D 2D 2D 36 36 36
8AA0- 36 36 36 3F 3F 3F 3F 3F
8AA8- 3F 3F 3F 24 24 24 24 24
8AB0- 24 24 2D 2D 2D 04 00 13
8AB8- 2D 0D 1B E4 3F 17 6E 0B
8AC0- 1B 20 24 24 00 13 24 5C
8AC8- 29 15 36 1E 27 48 29 2D
8AD0- 25 00 1B 2D 15 F6 3F 0F
8AD8- 1B 6C 92 36 36 04 00 09
8AE0- 1B 36 1E 3F 20 64 B5 DB
8AE8- 3F 3F 04 00 FF CE D5 C1
```

operating modes. From this second level you may save a HIRES screen to disk or load one into memory from disk, and you may enter a new schematic, edit one already in memory, or return to the first menu. If you select the enter or edit mode, you will next see the HIRES screen either blank or with the last schematic you put there. You also will see a small arrow and a three-digit number in the upper-left corner of the screen. The arrow indicates the rotation applied to the next shape to be drawn, and it may be turned by pressing the R key. The three-digit number shows the shape number to plot next.

To plot a shape, move the cursor to the desired place on the screen using the I, J, K, and M keys. Enter the shape number and push P (Plot). Some other available commands are Erase, Finish, and Text. This last command puts you into the text mode so that you can add text to your schematic.

The edit commands in the text mode are similar to those in the diagram mode except that you use the CTRL key to get the function desired. To get the text onto the screen, just type the characters desired and they will be plotted automatically. In both text and diagram modes you can move the cursor through your drawing without affecting the drawing. I have included a comprehensive set of instructions within the program and about two minutes of practice is all you will need to start diagramming. If you don't feel up to entering the EGG utility, you can always use the second method of putting the diagram into your programs.

Get some graph paper (I use paper with half-inch squares). Position the paper with the long side horizontal and draw a grid of half-inch blocks so that you have 16 columns and 12 rows. Draw a heavy line between the second and third row from the bottom. This line is the bottom of the page 1 screen. Starting at the top left, label the first column 15, the second column 30, the third column 45, and so on until the last column is labeled 270. Starting at the top left, label the rows in a similar fashion so that the bottom row is labeled 180. Next you should make copies of this as it is your worksheet for

*Program listing 2. This is a listing of the timer program discussed in the text. It works well; give it a try the next time you are playing with a 555 timer chip.*

```
10 D$ = "": REM  D$=CONTROL D
12 P =  PEEK (233)
13  IF P = 128 THEN 100
20  PRINT D$;"BLOAD SHAPEFILE 200, A$8000"
30  POKE 232,0: POKE 233,128
100  TEXT : HOME
110 P = 0
160  PRINT "   <<< 555 TIMER DESIGN PROGRAM >>>"
162  PRINT : PRINT "          <<< BILL SMITH, K3LF>>>"
170  PRINT : PRINT
180  PRINT
200  PRINT "FIND COMPONENTS, OUTPUT KNOWN ------ 1"
205  PRINT "FIND OUTPUT, COMPONENTS KNOWN ------ 2"
210  PRINT "END PROGRAM ------------------------ 3"
220  PRINT
260  GET A$
270  IF A$ = "1" THEN 280
271  IF A$ = "2" THEN 280
272  IF A$ = "3" THEN 9999
275  GOTO 260
280  FOR I = 1 TO 15: PRINT : NEXT I
300  HGR
310  GOSUB 4000
320  IF A$ = "1" THEN  GOTO 400
340  IF A$ = "2" THEN  GOTO 700
360  GOTO 200
380  REM  FOLLOWING PART CALCULATES RESISTOR VALUES, GIVEN OPERATING FRE
     Q., DUTY CYCLE, AND CAPACITOR VALUE
400  POKE 34,23
402 Y1 = 21
403  VTAB 24
410  INPUT "FREQUENCY ";F
412  VTAB (Y1)
415  PRINT  TAB( 2);F
418  VTAB 24
420  INPUT "DUTY CYCLE ( >50%) ";D
440  IF D <  = 50 THEN  GOTO 420
460  IF D > 100 THEN  GOTO 420
465  VTAB 24: PRINT
467  VTAB (Y1): HTAB 11
469  PRINT D;"%"
480 T1 = 1 / F * D / 100
500 T2 = 1 / F - T1
510  VTAB 24: HTAB 1
511  PRINT
512  VTAB 24
520  INPUT "VALUE OF C1 IN UF ";C
530  VTAB (Y1): HTAB 16
532  PRINT C
540 R2 = T2 / (0.693 * C / 1000000)
580 R1 = T1 / (0.693 * C / 1000000) - R2
590 R2 =  INT (R2)
600 R1 =  INT (R1)
628  VTAB (Y1): HTAB 23
630  PRINT R1
632  VTAB (Y1): HTAB 32
634  PRINT R2
650  VTAB 24
660  IF R1 + R2 > 5000000 THEN  PRINT "RESISTOR ARE TOO BIG "
680  INPUT "MENU OR RECALCULATE--M/R ";A$
682  IF A$ = "M" THEN  TEXT : GOTO 10
684 F5 = F:D5 = D:C5 = C:R5 = R1:R6 = R2
686  VTAB 21: PRINT "                                                "
687  VTAB 21
688  PRINT " ";F5; TAB( 11);D5; TAB( 16);C5; TAB( 23);R5; TAB( 32);R6
690  VTAB 22: HTAB 1
691  PRINT "                                                "
694 Y1 = 22
695  GOTO 403
700  REM   FOLLOWING PART CALCUATES OUTPUT, ON TIME, OFF TIME, AND FREQU
     ENCY GIVEN RESISTOR AND CAPACITOR VALUES.
702  POKE 34,23
705 Y1 = 21
710  REM
714  VTAB 24
720  INPUT "ENTER C1 IN UF ";C
724  VTAB (Y1): HTAB 16
728  PRINT C
730  VTAB 24
740  INPUT "ENTER R1 IN OHMS ";R1
746  VTAB (Y1): HTAB 22
748  PRINT R1
750  VTAB 24
760  INPUT "ENTER R2 IN OHMS ";R2
766  VTAB (Y1): HTAB 31
768  PRINT R2
786 T1 = 0.693 * C / 1000000 * (R1 + R2)
800 T2 = 0.693 * C / 1000000 * R2
820 D = T1 / (T1 + T2) * 100
840 D = ( INT (D * 10)) / 10
860 F = 1 / (T1 + T2)
864  IF F < 100 THEN 880
866 F =  INT (F)
870  GOTO 900
880 F = ( INT (F * 100)) / 100
900  VTAB (Y1): HTAB 2
905  PRINT F; TAB( 10);D
907 T1 =  INT (T1 * 1000000) / 1000
908 T2 =  INT (T2 * 1000000) / 1000
910  VTAB 23: HTAB 1
915  PRINT "OUTPUT>>>HIGH ";T1;" MS   LOW ";T2;" MS"
950  VTAB 24
955  INPUT "MENU OR RECALCULATE M/R ";A$
960  IF A$ = "M" THEN 100
962 F5 = F:D5 = D:C5 = C:R5 = R1:R6 = R2
964  VTAB 21
966  PRINT "                                                "
967  VTAB 21
968  PRINT  TAB( 1);F5; TAB( 10);D5; TAB( 16);C5; TAB( 22);R5; TAB( 31);
     R6
970  VTAB 23
972  PRINT "                                                "
974  VTAB 22
976  PRINT "
988 Y1 = 22
990  GOTO 710
4000  REM  PULSE GEN DIA.
4100  HGR
4110  SCALE= 1
4150  GOTO 4280
4200  REM >>> SUBROUTINE TO PRINT P$ AS TEXT ON HIRES SCREEN
4210 P =  LEN (P$)
4220  FOR I = 1 TO P
4230  IF  ASC ( MID$ (P$,I,1)) = 32 THEN 4260
4240  DRAW  ASC ( MID$ (P$,I,1)) - 31 AT X,Y
4260 X = X + 7
4270  NEXT I
4275  RETURN
4280  REM  HEADER ON HIRES DRAWING
4300 P$ = "       PULSE GENERATOR DESIGN"
4310 X = 3:Y = 5: GOSUB 4210
4330 Y = Y + 9:X = 70
4340 P$ = "555 TIMER CHIP"
4350  GOSUB 4210
4500  REM  <<< DRAW SCHEMATIC >>>
4510  DRAW 130 AT 135,30: DRAW 107 AT 120,45: DRAW 104 AT 135,45: DRAW 1
     08 AT 150,45
4520  DRAW 102 AT 105,120: DRAW 71 AT 150,120: DRAW 74 AT 105,135: DRAW
     74 AT 150,135
4530  DRAW 107 AT 105,60: DRAW 106 AT 120,60: DRAW 69 AT 150,60
4570  DRAW 116 AT 105,75: DRAW 117 AT 120,75: DRAW 101 AT 135,75: DRAW 1
     06 AT 150,75
4580  DRAW 129 AT 75,90: DRAW 101 AT 90,90: DRAW 122 AT 105,90: DRAW 124
      AT 120,90: DRAW 108 AT 135,90: DRAW 69 AT 150,90
4590  DRAW 119 AT 105,105: DRAW 118 AT 120,105: DRAW 104 AT 135,105: DRAW
     106 AT 150,105
4600  REM  <<< LABEL SCHEMATIC >>>
4650 X = 145:Y = 30:P$ = "B+": GOSUB 4210
4655 X = 160:Y = 60:P$ = "R1": GOSUB 4210
4660 X = 160:Y = 90:P$ = "R2": GOSUB 4210
4665 X = 160:Y = 120:P$ = "C1": GOSUB 4210
4670  DRAW 24 AT 131,80
4675  DRAW 23 AT 131,95
4680  DRAW 19 AT 131,110
4685  DRAW 18 AT 100,116
4690  DRAW 20 AT 92,85
4695  DRAW 21 AT 109,64
4700  DRAW 25 AT 124,64
4945 X = 35:Y = 80
4950 P$ = "SIGNAL"
4955  GOSUB 4210
4960 X = 50:Y = 89
4965 P$ = "OUT"
4970  GOSUB 4210
4975 P$ = "  FREQ   DUTY   C1     R1       R2"
4980 X = 3:Y = 147: GOSUB 4210
4990 P$ = "   HZ   CYCLE   UF    OHMS     OHMS"
4995 X = 3:Y = 155: GOSUB 4210
5999  RETURN
9999  END
```

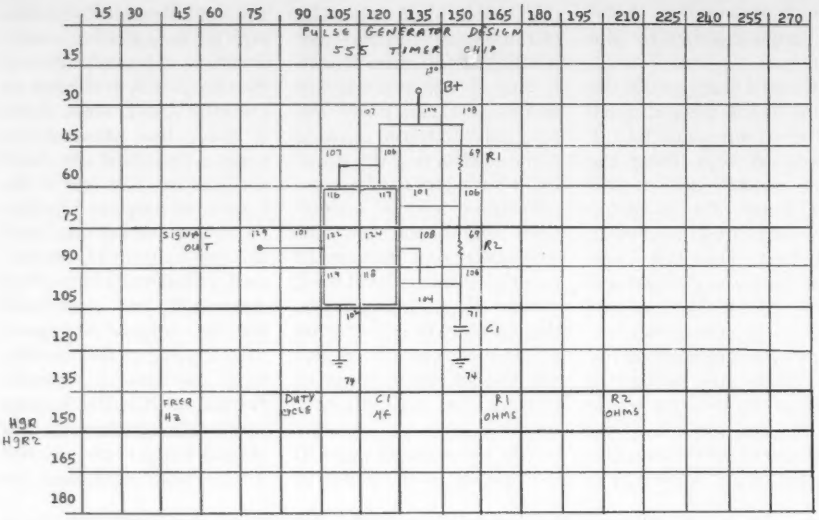


*Fig. 3. Example of the worksheet discussed in the text. The diagram is that of the schematic used in the timer program listed with this article.*

drawing and inputting schematics. (See Fig. 3.)

As an example of how to correctly use the worksheet, I have included my timer program in Fig. 3 and will step you through the procedure for implementing the schematic in that program. Notice that each shape making up the circuit is centered within a block so that its leads will exit in the middle of a side rather than at a corner. First, draw the diagram on the worksheet using only shapes from the shapefile. Next, label each shape with its corresponding number. Now enter any labels or text desired.

The next step is to enter the worksheet information into your program. In my example program (Program listing 2), the HIRES portion is located beginning on line 4000 and extends to the end of the program. Lines 4500 through 4590 draw the actual shapes. The easiest way to do this is draw all of the shapes on each worksheet row using one program line. This speeds up the programming process considerably when it comes to editing. Sometimes, when a row has only one shape, I will include that shape with the next row (such as line 4510 which draws the shapes for rows 30 and 45).

Lines 4200 through 4275 are a subroutine which makes the printing of text very easy. It takes the string P$ and prints it with normal character spacing beginning at the last values of X and Y. This subroutine will allow you to input only one line of text at a time. Additional

*Program listing 3. Here is the EGG draw-and-edit program listing. See text for a description of how it works.*

```
10  HOME :D$ = CHR$ (4): DIM N(4): DIM M$(4)
20  FOR I = 1 TO 4:N(I) = 17:N$(I) = "0": NEXT I
100 P = PEEK (233): HCOLOR= 3: SCALE= 1
110  IF P = 128 THEN 500
125  PRINT D$;"BLOAD SHAPEFILE 200,A$8000"
150  POKE 232,0: POKE 233,128
500  HOME : PRINT
510  PRINT "  ***  ELECTRONIC GRAPHICS GENERATOR  ***"
512  PRINT : PRINT "          (C)1 BY BILL SMITH, BSLF ****"
520  PRINT : PRINT : PRINT
530  PRINT "HIRES PAGE 1 + TEXT ---------- 1"
532  PRINT "HIRES PAGE 1 FULL SCREEN ------ 2"
534  PRINT "HIRES PAGE 2 ---------- ------- 3"
536  PRINT "INSTRUCTIONS ------------------ 4"
538  PRINT "END ---------- ---------- ------ 5"
540  PRINT
550  GET M$:M =  VAL (M$)
560  ON M GOTO 1000,2000,3000,4000,5000
570  GOTO 550
700  PRINT : PRINT : PRINT
710  PRINT "INPUT NEW SCHEMATIC ---------- 1"
720  PRINT "EDIT SCHEMATIC IN MEMORY ------ 2"
730  PRINT "SAVE DIAGRAM TO DISK ---------- 3"
740  PRINT "LOAD DIAGRAM FROM DISK -------- 4"
750  PRINT "RETURN TO MAIN MENU ---------- 5": PRINT
799  RETURN
1000  HOME
1010  PRINT "===================="
1012  PRINT "HIRES PAGE 1 + TEXT"
1014  PRINT "===================="
1020  GOSUB 700
1030  GET M$:M =  VAL (M$): PRINT
1050  ON M GOTO 1200,1400,1500,1600,500
1200 FS% = 1: HGR : GOSUB 6000
1300  TEXT : GOTO 1000
1400  IF FS% = 1 THEN 1450
1410  PRINT : INVERSE : PRINT "     NO DIAGRAM IN MEMORY     ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 1000
1450  POKE  - 16301,0: POKE  - 16300,0: POKE  - 16297,0: POKE  - 16304,
      0: GOSUB 6000
1490  TEXT : GOTO 1000
1500  GOSUB 8000
1510  GOTO 1000
1600  HGR :FS% = 1: POKE  - 16303,0: POKE  - 16300,0: GOSUB 8100
1610  HOME : GOTO 1000
2000  HOME
2010  PRINT "========================"
2012  PRINT "HIRES PAGE 1 - FULL SCREEN"
2014  PRINT "========================"
2020  GOSUB 700
2030  GET M$:M =  VAL (M$): PRINT
2050  ON M GOTO 2200,2400,2500,2600,500
2200 FS% = 2: HGR : POKE  - 16302,0: GOSUB 6000
2300  TEXT : GOTO 2000
2400  IF FS% = 2 THEN 2450
2410  PRINT : INVERSE : PRINT "     NO DIAGRAM IN MEMORY     ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 2000
2450  POKE  - 16304,0: POKE  - 16302,0: POKE  - 16300,0: POKE  - 16297,
      0: GOSUB 6000
2480  TEXT : GOTO 2000
2500  GOSUB 8000
2550  GOTO 2000
2600  HGR :FS% = 2: POKE  - 16303,0: POKE  - 16300,0: GOSUB 8100
2610  HOME : GOTO 2000
3000  HOME
3010  PRINT "============"
3012  PRINT "HIRES PAGE 2"
3014  PRINT "============"
3016  GOSUB 700
3030  GET M$:M =  VAL (M$): PRINT
3050  ON M GOTO 3200,3400,2500,3600,500
3200 FS% = 3: HGR2 : GOSUB 6000
3300  TEXT : GOTO 3000
3400  IF FS% = 3 THEN 3450
3410  PRINT : INVERSE : PRINT "     NO DIAGRAM IN MEMORY     ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 3000
3450  POKE  - 16302,0: POKE  - 16299,0: POKE  - 16297,0: POKE  - 16304,
      0: GOSUB 6000
3490  TEXT : GOTO 3000
3500  GOSUB 8000
3550  GOTO 3000
3600  HGR2 :FS% = 3: POKE  - 16303,0: POKE  - 16300,0: GOSUB 8100
3610  HOME : GOTO 3000
4000  HOME : REM   INSTRUCTIONS
4100  PRINT "              ": INVERSE : PRINT " INSTRUCTIONS ": NORMAL
      : PRINT
4110  PRINT "          ": INVERSE : PRINT " HIRES SCHEMATIC SHAPES ": NORMAL
      : PRINT : PRINT : PRINT
4120  PRINT " I ---------- CURSOR UP": PRINT " J ---------- CURSOR LEFT":
      PRINT " K ---------- CURSOR RIGHT": PRINT " M ---------- CURSOR DOW
      N": PRINT
4130  PRINT " R ---------- ROTATE SHAPE (SEE ARROW)": PRINT " E ---------
      - ERASE": PRINT " F ---------- FINISH (RETURN TO MENU)": PRINT " P
      ---------- PLOT SHAPE": PRINT " T ---------- TEXT MODE ": PRINT
4140  PRINT "@:9 ---------- ENTER SHAPE NUMBER"
4180  GOSUB 4300
4200  HOME : PRINT "              ": INVERSE : PRINT " INSTRUCTION ": NORMAL
      : PRINT
4210  PRINT "              ": INVERSE : PRINT " HIRES TEXT MODE ": NORMAL
      : PRINT
4220  PRINT "CTRL:": PRINT "     I ---------- CURSOR UP": PRINT "     J
      ---------- CURSOR LEFT": PRINT "     K ---------- CURSOR RIGHT": PRINT
      "     M ---------- CURSOR DOWN": PRINT
4230  PRINT "     R ---------- ROTATE TEXT": PRINT "     E --------- ERA
      SE": PRINT "     F ---------- FINISH (GO TO SHAPES)": PRINT
4240  PRINT "ESC - MOVE CURSOR ONE PIXEL ONLY": PRINT : PRINT "     I -
      --------- CURSOR UP": PRINT "     J ---------- CURSOR LEFT": PRINT "
      K ---------- CURSOR RIGHT": PRINT "     M ---------- CURSOR DOW
      N"
4250  GOSUB 4300
4260  GOTO 500
4300 P =  PEEK ( - 16384): POKE  - 16368,0: IF P > 127 THEN  RETURN
4310  GOTO 4300
5000  PRINT "5000": END
6000  REM  SUBROUTINE TO DRAW SHAPES
6010 X = 0:Y = 15: ROT= 0:N0 = 0:FR% = 0: XDRAW 66 AT 3,3:X1 = 12
6020  FOR I = 1 TO 4:N(I) = "0":N(I) = 17: NEXT I
6060  FOR I = 2 TO 4: XDRAW 17 AT X1,3:X1 = X1 + 7: NEXT
6110 C1 = 1
6150 X = X + 15: IF X < 270 THEN 6200
6170 X = 15:Y = Y + 15: IF FS% = 1 AND Y = 165 THEN Y = 15
6180  IF Y = 195 THEN Y = 15
6200  XDRAW 127 AT X,Y: IF C1 = 1 THEN C1 = 2: GOTO 6250
```

lines may be processed automatically by incrementing Y when the value of X gets to 274. Lines 4280 through 4350 print the header on the diagram using P$ and the line 4200 subroutine. Lines 4600 through to the end are the labels for the schematic and the remainder of the text on the HIRES screen.

The schematic for my timer program is small enough so that I was able to use HIRES page 1 and use the four text lines at the bottom for my calculations. This is a very convenient setup as I can see the diagram at the same time I am calculating values. To get the most out of the four lines below the HIRES screen, I put the column headings directly on the HIRES screen at the bottom. Most of my programs with schematics require that the calculations be displayed on page 1 of text while the schematic is on the full-screen HIRES page 2. In these programs I include a small subroutine which allows me to flip between the schematic and the calculations. This is accomplished by checking each input to the calculations for an ESC. When one is encountered, use the "soft switches" described on pages 12 and 13 of the Apple reference manual to display the desired HIRES page. To return to the calculations, use the same system. Check for the ESC key to be depressed, then use the soft switches to display text page 1. This method will leave your calculations intact while you examine the circuit and you will have to draw the circuit only once as it is preserved unchanged.

Most of the shapes in the shapefile are self-explanatory, but there are a few requiring comments. Shape 70 is a variable resistor. If you connect a lead to the left side, it will appear as a regular potentiometer. Shape 79 can be used for coils, transformers, or chokes. Shapes 84, 85, and 86 are leads to be used with the op amp, shape 83. Using these leads will allow you to connect the op amp to other components using the standard configuration. Shape 88 is a bridge rectifier, while shape 89 can be used for meters and other round items.

Shapes 93 through 99 are for transistors and FETs. To draw a transistor, you must combine four shapes, but they make very nice transistors. I use shapes 116 through 119 to draw ICs.

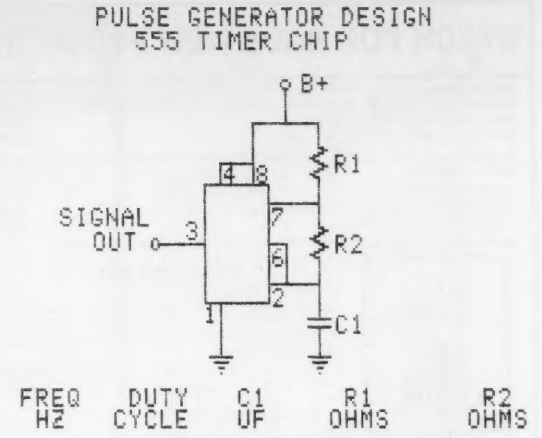


*Fig. 4. Actual HIRES screen of the schematic used in the timer program. See Fig. 3 for the worksheet used to develop this schematic.*

```
6220 C1 = 1
6250  FOR K = 1 TO 15:P =  PEEK ( - 16384): NEXT
6280  POKE  - 16368,0
6300  IF P < 127 THEN 6200
6310  IF P > 175 AND P < 186 THEN  GOSUB 6800
6350  IF C1 = 2 THEN  XDRAW 127 AT X,Y:C1 = 1
6360  IF P = 160 THEN 6110: REM  SPACE BAR
6370  IF P <  > 208 THEN 6380: REM  PLOT
6375  IF N0 > 1 AND N0 < 132 THEN  ROT= FR%: XDRAW N0 AT X,Y: GOTO 6110

6380  IF P = 155 THEN 7000: REM  ESC TO TEXT
6410  IF P <  > 201 THEN 6430: REM  I
6415 Y = Y - 15
6418  IF Y = 0 AND FS% = 1 THEN Y = 150
6420  IF Y = 0 THEN Y = 180
6425  GOTO 6200
6430  IF P <  > 202 THEN 6450: REM  J
6440 X = X - 15: IF X = 0 THEN X = 15
6445  GOTO 6200
6450  IF P = 203 THEN 6110: REM   K
6470  IF P <  > 205 THEN 6490: REM  M
6480 Y = Y + 15: IF Y = 165 AND FS% = 1 THEN Y = 15
6482  IF Y = 195 THEN Y = 15
6485  GOTO 6200
6490  IF P <  > 197 THEN 6510: REM   E
6495 M%((X / 15),(Y / 15)) = 0: DRAW 126 AT X,Y: XDRAW 126 AT X,Y: GOTO
     6200
6510  IF P <  > 210 THEN 6530: REM  R
6515  XDRAW 66 AT 3,3
6520 FR% = FR% + 16: IF FR% = 64 THEN FR% = 0
6528  ROT= FR%: XDRAW 66 AT 3,3: GOTO 6200
6530  IF P <  > 198 THEN 6540: REM    F
6535  FOR I = 0 TO 8: DRAW 68 AT ((I * 5) + 3),3: XDRAW 68 AT ((I * 5) +
     3),3: NEXT : RETURN
6540  IF P = 211 THEN 6700: REM  SHIFT
6699  GOTO 6200
6700  REM  MOVE ROUTINE
6710  GOTO 6200
6800 N(1) = P - 159
6810 X1 = 12:Y1 = 3: ROT= 0
6820  FOR I = 4 TO 2 STEP  - 1: XDRAW N(I) AT X1,3:N(I) = N(I - 1): XDRAW
     N(I) AT X1,3:X1 = X1 + 7: NEXT
6890  ROT= FR%
6910  FOR I = 1 TO 4:N$(I) =  STR$ (N(I) - 17): NEXT I
6920 N0$ = N$(4) + N$(3) + N$(2):N0 =  VAL (N0$): ROT= FR%
6999  RETURN
7000  REM  PROCESS TEXT
7010 X2 =  - 3:Y2 = 11
7090 C2 = 1
7100 X2 = X2 + 6: IF X2 < 274 THEN 7200
7120 X2 = 3:Y2 = Y2 + 8
7130  IF Y2 > 155 AND FS% = 1 THEN Y2 = 11
7140  IF Y2 > 187 THEN Y2 = 11
7200  XDRAW 68 AT X2,Y2
7210  IF C2 = 1 THEN C2 = 2: GOTO 7230
7220 C2 = 1
7230  FOR I = 1 TO 20:P =  PEEK ( - 16384): NEXT I: POKE  - 16368,0
7250  IF P < 127 THEN 7200
7260  IF C2 = 2 THEN  XDRAW 68 AT X2,Y2: IF C2 = 2 THEN C2 = 1
7400  IF P > 160 AND P < 221 THEN  GOTO 7800
7410  IF P = 221 THEN 7120
7420  IF P = 160 THEN 7100
7430  IF P <  > 136 THEN 7440
7435 X2 = X2 - 6: IF X2 < 3 THEN X2 = 3
7436  DRAW 68 AT X2,Y2: XDRAW 68 AT X2,Y2: GOTO 7200
7440  IF P = 149 THEN X2 = X2 + 6: IF X2 > 275 THEN X2 = 275: GOTO 7200

7450  IF P <  > 137 THEN 7460
7455 Y2 = Y2 - 8: IF Y2 < 11 THEN Y2 = 11: GOTO 7200
7460  IF P <  > 138 THEN 7470
7465 X2 = X2 - 6: IF X2 < 3 THEN X2 = 3: GOTO 7200
7470  IF P <  > 139 THEN 7480
7475 X2 = X2 + 6: IF X2 > 274 THEN X2 = 274: GOTO 7200
7480  IF P <  > 141 THEN 7490
7485 Y2 = Y2 + 8: IF Y2 > 155 AND FS% = 1 THEN Y2 = 155: IF Y2 > 188 THEN
     Y2 = 188: GOTO 7200
7490  IF P <  > 155 THEN 7500
7500  GET E$:E = ASC (E$)
7510  IF E  > 73 THEN 7520
7515 Y2 = Y2 - 1: IF Y2 < 11 AND FS% = 1 THEN Y2 = 154: IF Y2 < 11 THEN
     Y2 = 188
7516  GOTO 7200
7520  IF E <  > 74 THEN 7530
7525 X2 = X2 - 1: IF X2 < 3 THEN X2 = 3
7526  GOTO 7200
7530  IF E <  > 75 THEN 7540
7535 X2 = X2 + 1: IF X2 > 275 THEN X2 = 275
7536  GOTO 7200
7540  IF E <  > 77 THEN 7550
7545 Y2 = Y2 + 1: IF Y2 > 154 AND FS% = 1 THEN Y2 = 11: IF Y2 > 188 THEN
     Y2 = 11
7546  GOTO 7200
7550  IF P <  > 133 THEN 7560
7555  DRAW 68 AT X2,Y2: XDRAW 68 AT X2,Y2: GOTO 7200
7560  IF P <  > 130 THEN 7570
7565  XDRAW 68 AT X2,Y2: GOTO 7100
7570  IF P = 134 THEN  GOTO 6200
7580  IF P <  > 146 THEN 7600
7585  XDRAW 66 AT 3,3:FR% = FR% + 16: IF FR% = 64 THEN FR% = 0
7586  ROT= FR%: XDRAW 66 AT 3,3: GOTO 7200
7600  GOTO 7200
7800  XDRAW P - 159 AT X2,Y2: GOTO 7100
8000  PRINT : PRINT : INPUT "ENTER FILE NAME (M FOR MENU) ";F$
8010  IF F$ = "M" THEN  RETURN
8020  IF FS% = 3 THEN 8040
8025 S$ = "BSAVE " + F$ + ",A$2000,L$2000"
8030  PRINT D$;F$: HOME : RETURN
8040 F$ = "BSAVE " + F$ + ",A$4000,L$2000"
8050  PRINT D$;F$: HOME : RETURN
8100  PRINT : PRINT : INPUT "ENTER FILE NAME TO LOAD (M - MENU) ";F$
8110  IF F$ = "M" THEN  RETURN
8120  IF FS% = 3 THEN 8150
8125  ONERR  GOTO 8190
8130 F$ = "BLOAD " + F$ + ",A$2000"
8140  PRINT D$;F$
8146  RETURN
8150 F$ = "BLOAD " + F$ + ",A$4000"
8155  ONERR  GOTO 8190
8160  PRINT D$;F$
8180  RETURN
8190  PRINT : INVERSE : PRINT "   FILE NOT FOUND   ": NORMAL : FOR I =
     1 TO 800: NEXT I
8194  IF FS% = 1 THEN  GOTO 1000
8195  IF FS% = 2 THEN  GOTO 2000
8196  IF FS% = 3 THEN  GOTO 3000
```

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This allows enough room to label the pins clearly. The remainder of the shapes should be fairly self-explanatory, and if you are not sure about what a shape does, just try drawing it on your computer. If you want to add shapes to your shapefile, you should consult your Apple reference manuals and be familiar with shapetables. To conform to my system, the new shape should be drawn on a 15 × 15 grid and the origin of the shape should lie at the center (coordinates 8,8). Also remember to have all leads exit at the middle of a side. In setting up the shapetable listed here, I used a program from *Micro Magazine*, September, 1980, called "Creating Shape Tables, Improved," by Peter A. Cook.

I have listed the shapefile beginning at $8000. Note the $00 beginning at $810c and extending to $8193. These 00s are necessary for proper operation, and this is the space set aside to address additional shapes which might be added to the end of the table in the future. If you enter this shapetable by hand, you can edit the shapes by remembering that each shape is separated by a hex 00. If you have a problem with, for example, shape #9, find the ninth set of hex 00s in the listing and you will be looking in the correct area. This shapefile is quite lengthy so I will make a copy available on disk. If you send me $12.00, I'll send you a copy of the shapefile and the EGG utility program. In addition, I will include a copy of the timer program and a couple of copies of my worksheet. The timer program and the EGG utility are written in Applesoft BASIC and recorded using DOS 3.3. I hope you get as much utility out of my EGG as I have; it will add a whole new dimension to your programs with a minimum of effort. ■


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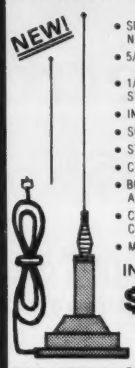


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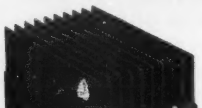

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Installing presently-popular amateur transceivers in the limited space of today's cars can often prove to be a hair-raising experience. While slide-in mounts and rig-hanging brackets may be readily available for some units, these mounts often place their respective rigs in rather awkward positions. When the rig is removed from the car, the unused mount or bracket may continue to occupy vital interior room and thus further emphasize the need for a more flexible arrangement.

The mounting techniques presented in this article will attempt to alleviate those problems and provide a simple yet effective means of containing the rig in a desired location. Since the majority of mobile installations are usually more involved than merely placing a transceiver in the car, I'll also briefly consider antenna cabling and dc power-cord routing. Amateurs following these general guidelines should be able to progress from a "stock" new car to a complete mobile installation in less than an hour's time (assuming everything needed isn't buried at the bottom of a junkbox!).

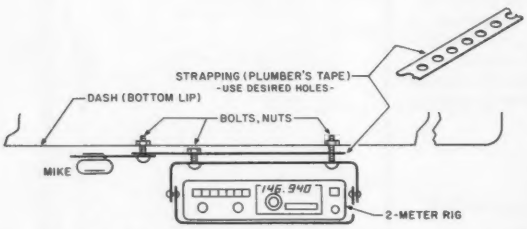


*Fig. 1. Method of using strapping to mount a rig under the dash, using existing holes. Screw and nut sandwiched between the dash bottom; strapping should be short and thin for snug mounting and to prevent scratching the rig. The mike holder can be screw-mounted to one of the holes in the strapping.*

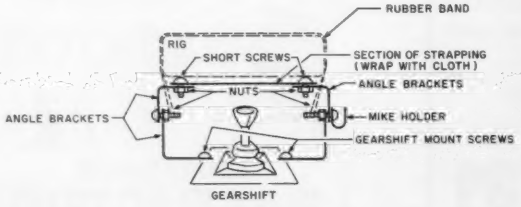


*Fig. 2. Method of using hardware-store L-brackets and metal strapping for a universal mount on small autos. Rig's front sits on the covered strap and is held securely by a rubber band. Brackets may be tilted as desired.*

### Rig Location/ Mounting Ideas

An amateur owning a large automobile with a full-width dash, bench-type seat, and no center console

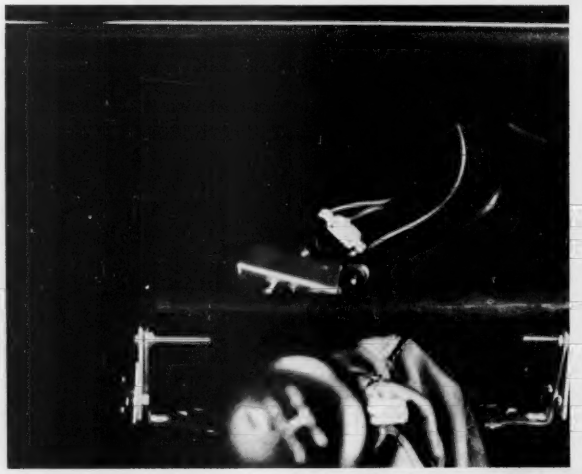

*Fig. 3. The home-brew mount. Note the power connectors for various rigs in the background.*

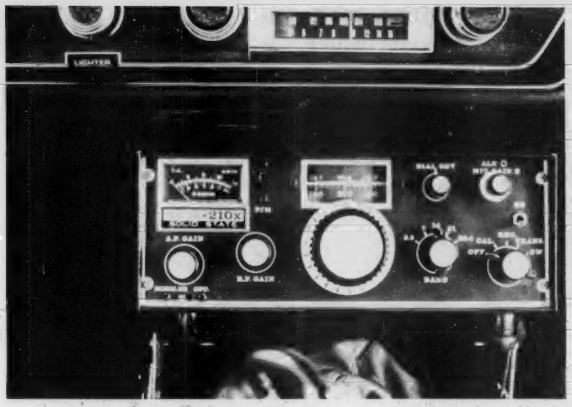

*Fig. 4. Low-band transceiver is side-slid into position with its front feet catching on the bracket. The rear of the rig is sitting on the transmission hump. The squeezed position assists in securing the rig, eliminating need for a hold-down strap.*

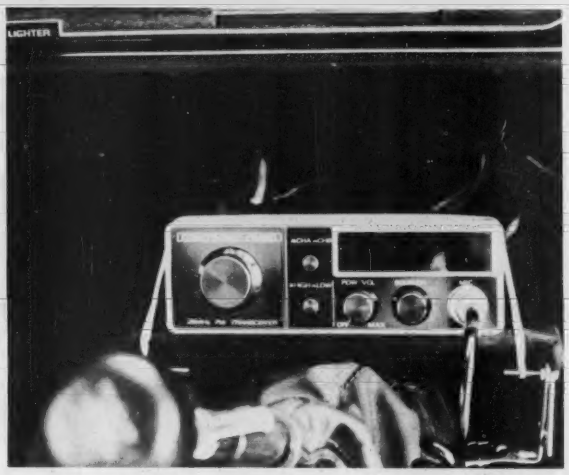

*Fig. 5. This rig-mounting bracket is ideally suited to rapid installation artists. The unit is merely placed on the mount and secured with a heavy rubber band. Either top or bottom-mounted speakers can be used with this arrangement.*

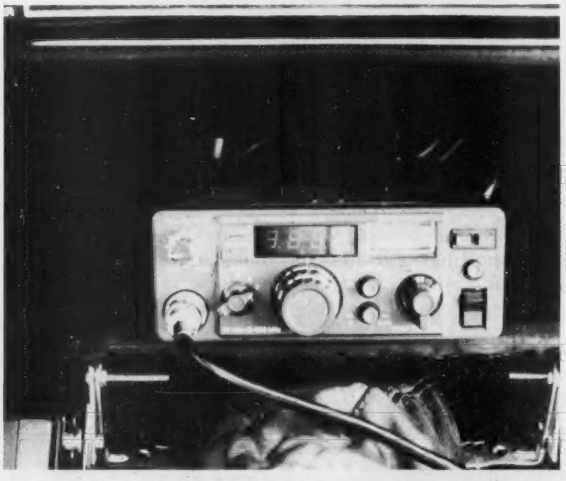

*Fig. 6. A second (or third!) rig can be used with the bracket of Fig. 5. If front feet don't secure the rig, use a heavy rubber band. Note the mike mount on the left side of the bracket.*

will experience few problems mounting his rig or rigs. If existing holes in the under-dash lip don't align with the rig mounting bracket, a section of metal strapping (plumber's tape) can be used as a "hole relocator." This arrangement is shown in Fig. 1. The rig's rear area can rest lightly on the auto's carpet, if necessary, and a small chock can be used if thick carpeting blocks air flow around heat sinks.

Mounting 2-meter FM-sized transceivers (and possibly small-sized low-band transceivers) in compact autos exhibiting miniscule dash-to-transmission-hump clearance can prove to be difficult. The most logical solutions here involve using home-brew brackets and existing supports for maximum benefit. One example of this technique is shown in Fig. 2. Four L-brackets are bolted together as shown, with heavy metal strapping bolted between the upper L-brackets. The lower L-brackets are secured to the auto's gearshift mounting L-plate via existing screws. These are slightly underneath the floor shift's rubber boot in autos such as the Sunbird, Monza, Skyhawk, etc.; squeezing the boot's bottom will reveal the screws. The upper L-brackets' size and angle of tilt can be varied as desired for proper rig positioning. In order to prevent rig scratches, cover the brackets' upper area with a couple of layers of cloth matching the auto's interior, and sew the cloth tight.

This mount can be used with a variety of rigs, depending on the particular auto's hump-to-dash clearance. A 2-meter rig, for example, can be placed on the mount and secured in place by a rubber band stretched between the long L-bracket screws. (How's that for a quick install/remove caper?) An HF rig such as the Atlas, Kenwood TS-120, etc., can also be side-slid into this bracket by positioning its front feet in front of the covered metal strap while the dash itself secures the rig from its top-side (the rig's rear then rests on the transmission hump). Other rigs can also be used with this L-bracket setup merely by securing them with a rubber band when necessary. A small towel the same color as the auto's carpet can be used to cover or camouflage the rig during brief out-of-car stops. (Be aware, however, that any out-of-view auto is open prey to rip-off artists).

Many small and intermediate-sized autos feature bench-style seats and one-piece dashes which can support 2-meter FM rigs, but may present problems for securely supporting larger HF rigs. An effective mounting idea for these autos involves propping the HF rig between the front seat's edge and the transmission's hump, securing it with a cloth-covered boat tie-down strap as shown in Fig. 7. If connecting cables dig into the carpet or if the rig's heat sink is slightly obstructed, a small piece of wood or indoor/outdoor carpet may be used for chocking. All rig cables and the tie-down strap can merely be pushed under the seat when not in use, providing a perfectly clean-looking interior. Cloth-covered tie-down straps are

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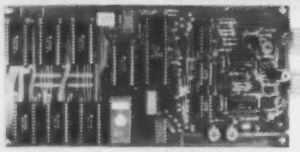

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available from boating supply or sporting goods stores, with most stores boasting on-the-spot assembly of the tie-down in any desired length. The highest price I have found on tie-downs is $3.00 each.

*Fig. 7. Mobile installation of traveling amateur W4CEC consists of an Azden 2-meter rig and Kenwood TS-120. The 120 is merely propped on the auto's seat; its tilt-down front bail secures the unit and eliminates the need for a tie-down strap. The Azden is secured, complete with bracket, by a tie-down strap hooked under the dash. Clever and convenient, and both rigs can be removed in a snap.*

Two special-consideration-type mounts which may be applicable to small autos with center consoles involve mounting a mobile rig sideways on either the console or the drive-shaft tunnel right behind the rider's seat. This arrangement is illustrated in Fig. 8. Surprisingly, the front mounting often will support a large low-band rig while the rear mount supports a 2-meter rig.

### Routing Cables

Today's tightly-assembled autos can prove quite challenging to cable routing, but a few tricks of the trade can simplify that situation. Antenna transmission line can easily be routed through the auto's trunk area by moving the rear seat on the rider's side and poking part of a stiff, discarded whip antenna through to the trunk. Next, tape the coaxial cable to the end of that whip and pull it into the auto's interior. (Use heavy-duty filament tape and help the cable along for first-try success.) Additional cables, if desired, can then be taped to the initial cable and pulled through in a similar manner. Routing cables on the auto's right (rider) side also is good due to the absence of steering wheel, floor pedals, etc.

The whip-antenna trick is also useful for passing power cords through auto firewall openings. The most logical and convenient opening to use is the expandable grommet through which the speedometer cable passes. Again, poke the whip into the auto's interior, tape the cable to the whip rod's tip and pull it back through the grommet, helping it as necessary.

Finally, make a composite resistance check in the following manner to ensure solid ground connections. Short the antenna's center conductor and shield at the antenna proper, then measure from the power cord's negative lead, through the auto body, through the antenna mount, and back to the center conductor of the PL-259 for less than 1 Ohm's resistance. At this point, you are ready to check alternator/battery voltage with the motor running to ensure that less than 14 volts is delivered... and then connect the rig.

### Conclusion

The techniques of mounting amateur gear in autos varies with each set of circumstances, yet each installation can be made easier by using ideas tried and proven by others. I hope this collection of thoughts and views will prove helpful in both the installation and operation of your existing or future mobile rigs. ■

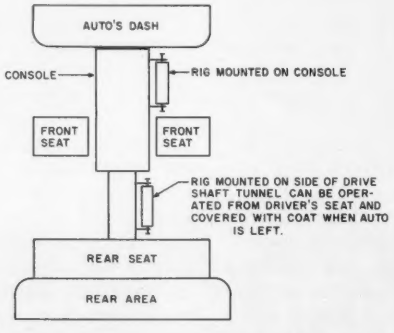
AUTO'S DASH
CONSOLE
RIG MOUNTED ON CONSOLE
FRONT SEAT
FRONT SEAT
RIG MOUNTED ON SIDE OF DRIVE SHAFT TUNNEL CAN BE OPERATED FROM DRIVER'S SEAT AND COVERED WITH COAT WHEN AUTO IS LEFT.
REAR SEAT
REAR AREA

*Fig. 8. Two rig-mounting locations for small autos which provide flexibility and a degree of security. Location behind rider's seat is preferred for small 2m FM units.*

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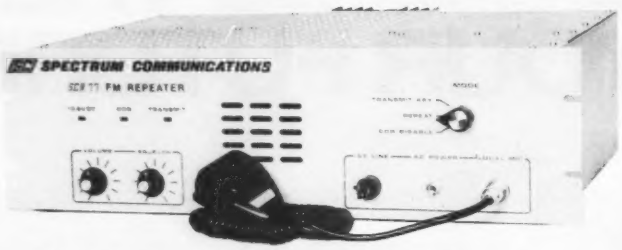


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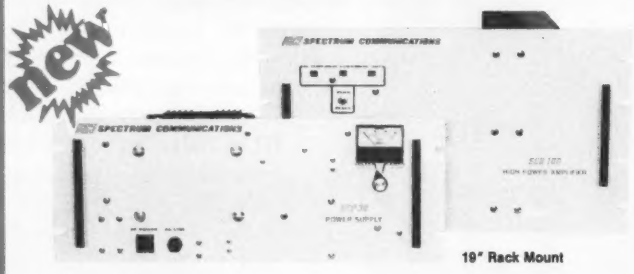


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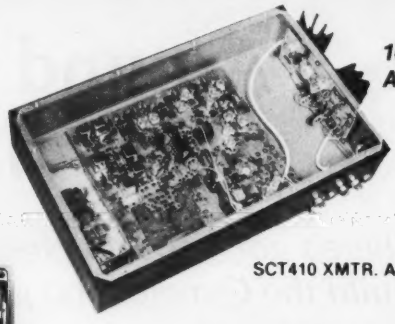

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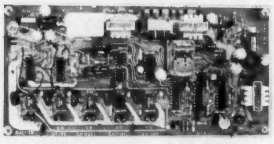

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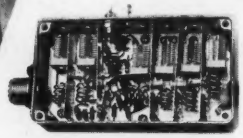

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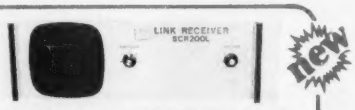


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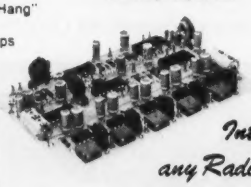

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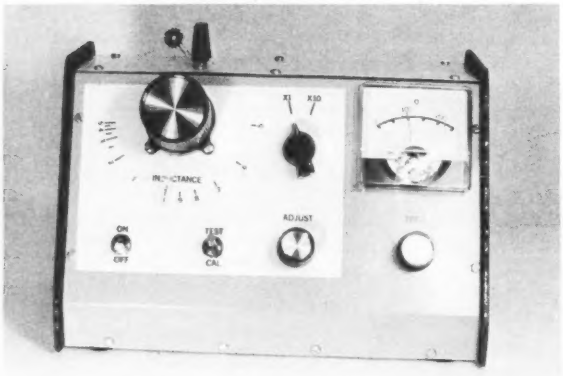
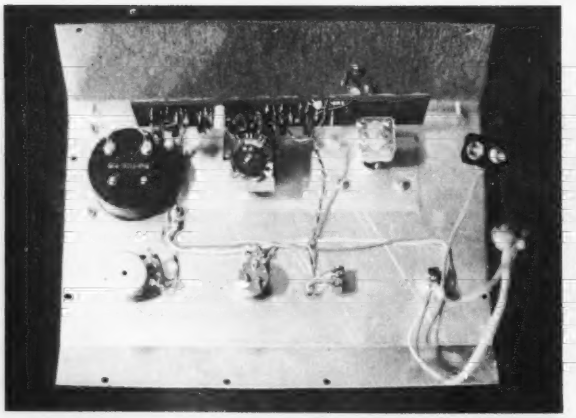



*Front view of completed Q-meter.*

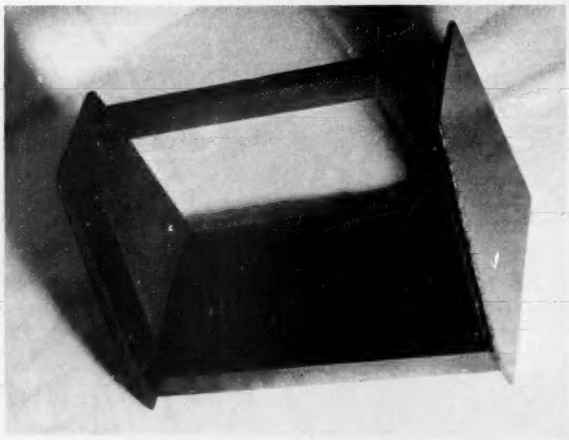
Winding coils for a new project seems to be one of the more frightening aspects of the job. One reason may be the fear that we may not be able to duplicate the author's model. If we have a way to check each coil before it's installed, much of the apprehension is removed. A "Q"-meter will do this by measuring the coil's inductance and Q. The unit pictured is such a Q-meter that will measure inductances from .5 uH to 50 uH and Qs to 200. It's easy to build, easy to operate, and is powered by an internal 9-volt battery or wall-plug power supply.

There are four basic parts to this Q-meter: a dual-frequency rf oscillator, an FET voltmeter, a power supply, and the tank circuit that indicates the inductor of unknown value ($L_x$).

Fig. 1 is the schematic. A 2N2222 transistor serves as the rf oscillator, followed by an MPF-102 JFET buffer. The range of measurement is controlled by the oscillator frequency and the tank variable capacitor. With the capacitor specified, the range is .5 to 5 uH at a frequency of 20.05 MHz, and 5 to 50 uH at 6.34 MHz. The two toroid coils resonate with C1 and C2 to produce these frequencies, and S1 determines the range in use. The buffer stage provides the neces-



*Assembled panel and top plate showing component mounting.*



*Pine and Masonite™ case for the Q-meter.*

sary low impedance excitation for the tank circuit through C8. A 1N270 germanium diode (D1) rectifies the rf output of the buffer and is used to calibrate the meter before taking a measurement. A hot-carrier diode (D2) is placed across the variable capacitor and rectifies the tank circuit current to provide a dc voltage that is proportional to the Q of $L_x$ at resonance. It is this voltage that is measured in the TEST position of S2.

The JFET voltmeter uses two MPF-102 JFETs, zeroed by R15. Full scale on the meter should be 250 microamps or less. The critical components have been selected so that the Q reading will be quite accurate if 100 is used as the calibration reference. The meter I used is calibrated from zero to 250 and is a 200-uA movement. A more sensitive meter will require using a higher resistance setting of R12, but will not affect the unit's accuracy. Qs of 250 or more are seldom required and are difficult to obtain, so there is not much need to have a higher scale.

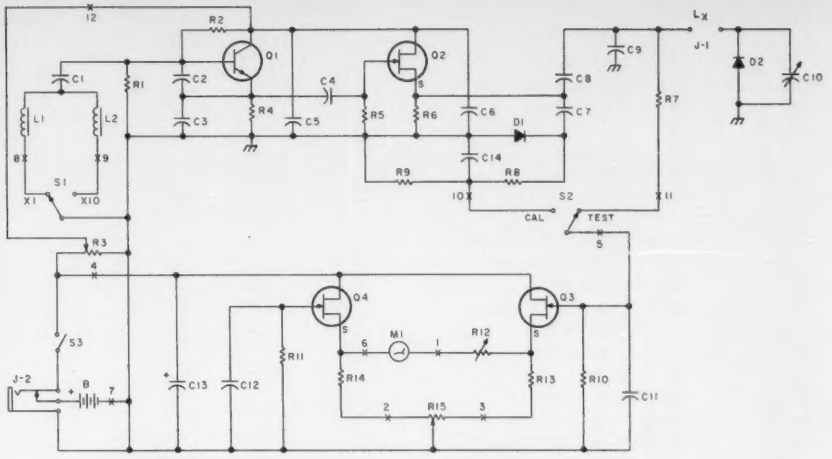



*Fig. 1. Circuit schematic.*

As for construction, there is really only one critical portion—the mounting of the tank components (C9, C10, and the terminals for $L_x$). At 50 uH, an inch or two of extra wire will not have much effect on accuracy, but at .5 uH, the leads must be kept as short as possible. This is one reason for the miniature variable capacitor and small unit for C9. The terminals for $L_x$ consist of 4-40 bolts mounted directly to the Formica™ top, using solder lugs to connect to the circuit board components and 4-40 hex nuts fastened by epoxy to small wire nuts for holding the unknown inductor leads. Small 5-way connectors should also work fine. Although I used an import vernier dial mechanism and attached a plastic pointer, a non-reduction knob will work quite well—it's just a little harder to get right on resonance. The shaft of C10 is too short to reach the panel. It can be

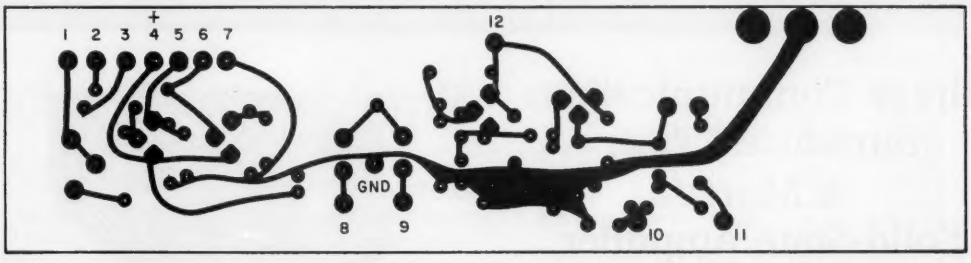



*Fig. 2. Circuit board.*

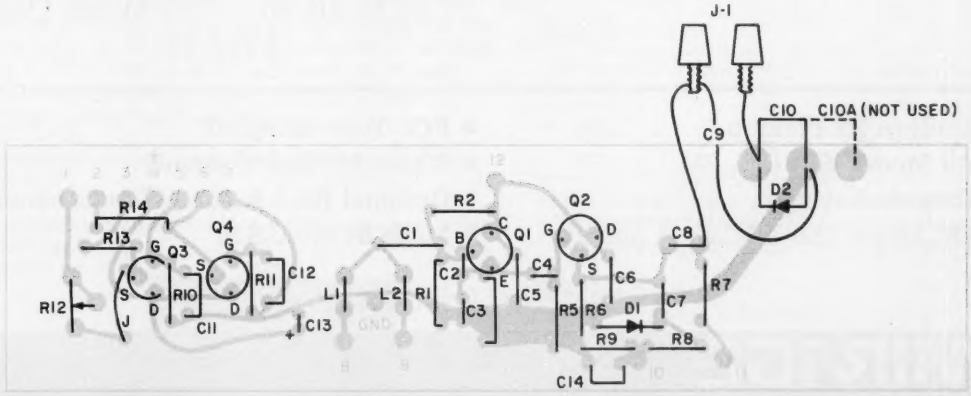



*Fig. 3. Component layout, foil side view.*

**Parts List**

| | |
|---|---|
| C1 | 620-pF ceramic disc |
| C2, C3 | 68-pF NPO ceramic |
| C4 | 56-pF NPO ceramic |
| C5, C6, C11, C12 | .01 ceramic disc |
| C7 | 100-pF ceramic |
| C8 | 22-pF NPO ceramic |
| C9 | 1500-pF poly |
| C10 | 138-pF variable (RS A1-234) |
| C13 | 10-uF, 25-V electrolytic |
| D1 | 1N270 germanium diode |
| D2 | MBD-101 hot carrier diode |
| R1 | 47k, ¼-Watt carbon |
| R2 | 100k, ¼-Watt carbon |
| R3 | 10k linear pot |
| R4 | 1.5k, ¼-Watt carbon |
| R5, R9 | 1-meg, ¼-Watt carbon |
| R6 | 390-Ohm, ¼-Watt carbon |
| R7, R10, R11 | 2.2-meg, ¼-Watt carbon |
| R8 | 100k, ¼-Watt carbon |
| R12 | 100k trimmer |
| R13, R14 | 150-Ohm, ¼-Watt carbon |
| R15 | 2k linear standard pot |
| L1 | 1.97 uH (21 turns #24 enamel on T-37-2 toroid) |
| L2 | 19.7 uH (70 turns #32 enamel on T-37-2 toroid) |
| S1 | SPDT rotary |
| S2 | SPDT mini-toggle |
| S3 | SPST mini-toggle |
| M1 | 200-uA meter (see text) |
| J1 | Connectors for $L_x$ (see text) |
| J2 | Mini phone jack (normally-closed circuit) |

lengthened by attaching a one-quarter-inch round metal spacer with a bolt into the capacitor's threaded shaft. An alternative would be a small flexible coupler and a piece of ¼-inch shaft.

The total current drain is under 15 mA, so a 9-volt battery will last a long time with intermittent use. For ac operation, any rectified and filtered wall-plug supply that is rated at 4.5 to 9 volts fills the bill.

To put the Q-meter to work, set S2 to TEST, turn on the power switch, and adjust the meter to zero reading with R15. Switch S2 to CAL and set the rf level to 100 on the meter by adjusting R3. Connect the coil you want to measure, using the shortest possible leads. Reset S2 to TEST; tune C10 for maximum deflection of the meter. The reading is the approximate Q of the unknown inductor. If you cannot get any upward deflection of the meter, try the other position of S1. If you still cannot get a reading and you are quite sure the unknown inductance falls within the range of the meter, recheck the $L_x$ connections. A good connection is a must for reliable operation of the Q-meter.

A test coil can be made by winding about 15 turns of #24 enamel-covered wire in a T-37-2 or T-37-6 toroid. You should measure it somewhere around 1 uH with a Q of about 100. If you are satisfied with the results, you may want to mark the measured information on a tag and attach it to the inductor. It can be used later to check the performance of the meter if you should question a reading on some unknown coil.

This relatively simple project can take a lot of the fear out of coil-winding, as well as sort out unmarked small inductors and provide the identification you need. ■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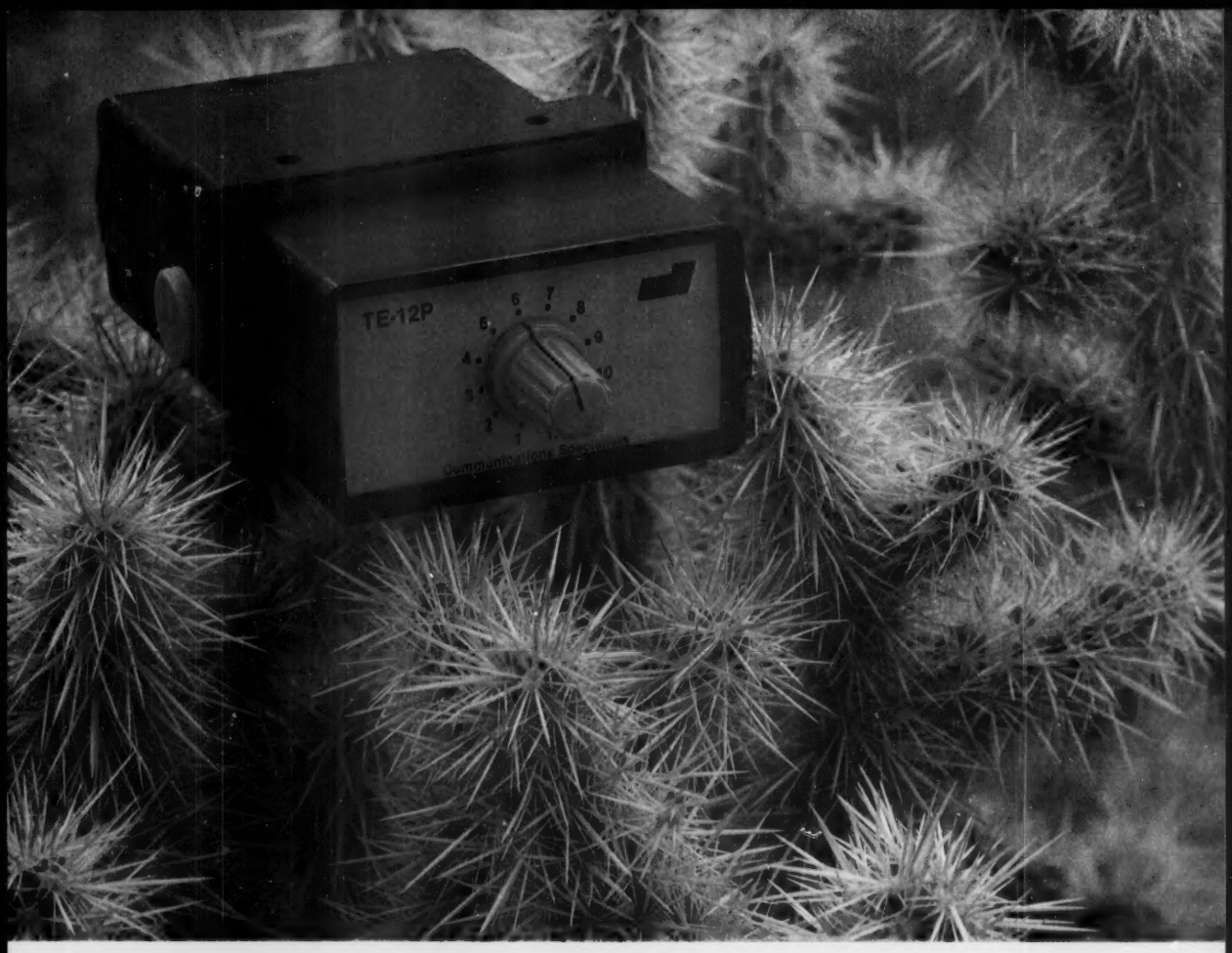


# Stuck with a problem?

Our TE-12P Encoder might be just the solution to pull you out of a sticky situation. Need a different CTCSS tone for each channel in a multi-channel Public Safety System? How about customer access to multiple repeater sites on the same channel? Or use it to generate any of the twelve tones for EMS use. Also, it can be used to access Amateur repeaters or just as a piece of versatile test equipment. Any of the CTCSS tones may be accessed with the TE-12PA, any of the audible frequencies with the TE-12PB. Just set a dip switch, no test equipment is required. As usual, we're a stickler for 1day delivery with a full 1 year warranty.

- Output level flat to within 1.5db over entire range selected.
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- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
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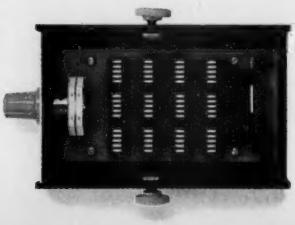

**TE-12PA**

| | | | | | |
|---|---|---|---|---|---|
| 67.0 XZ | 85.4 YA | 103.5 1A | 127.3 3A | 156.7 5A | 192.8 7A |
| 71.9 XA | 88.5 YB | 107.2 1B | 131.8 3B | 162.2 5B | 203.5 M1 |
| 74.4 WA | 91.5 ZZ | 110.9 2Z | 136.5 4Z | 167.9 6Z | |
| 77.0 XB | 94.8 ZA | 114.8 2A | 141.3 4A | 173.8 6A | |
| 79.7 SP | 97.4 ZB | 118.8 2B | 146.2 4B | 179.9 6B | |
| 82.5 YZ | 100.0 1Z | 123.0 3Z | 151.4 5Z | 186.2 7Z | |

- Frequency accuracy, ±.1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order.
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**TE-12PB**

| TEST-TONES: | TOUCH-TONES: | | BURST TONES: | | | |
|---|---|---|---|---|---|---|
| 600 | 697 | 1209 | 1600 | 1850 | 2150 | 2400 |
| 1000 | 770 | 1336 | 1650 | 1900 | 2200 | 2450 |
| 1500 | 852 | 1477 | 1700 | 1950 | 2250 | 2500 |
| 2175 | 941 | 1633 | 1750 | 2000 | 2300 | 2550 |
| 2805 | | | 1800 | 2100 | 2350 | |

- Frequency accuracy, ±1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

**$89.95**

15

**COMMUNICATIONS SPECIALISTS**

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# Nothing matches the MACC in voltage surge protection and component-by-component on-off control

- compact, attractive desk-top console
- eight clean AC power outlets
- individual and master on-off control
- superior three-stage auto-restore circuit with manual reset circuit breaker
- individually lighted rocker switches

Lightning striking miles away, electric motors running on the same power line, fluorescent lighting and even wind-driven snow static buildup can cause problems with delicate circuits and miniature electronic chips. But the MACC, within nanoseconds, can recognize the current disturbance, then clip it off and dissipate it, while maintaining clean current flow to your system's equipment. The MACC protects all semi-conductor, solid-state circuitry.

The MACC is designed with three 2000-amp surge discharge protection circuits — one between each of the AC input's hot, neutral and ground lines. Other surge devices may use a single 100-amp surge protector between the hot and neutral lines only. Its resettable circuit breaker adds further protection.

MACC gives you control convenience, too. It provides 8 plug-in "U" ground outlets for your components — including one "hot" outlet for a continuously powered application such as your clock. Seven "on/off" rocker switches let you control individual components. And you can turn your entire system on or off with a single master rocker switch.

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- Melting of "hot spots" within semi-conductor devices
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- Insulation breakdown causing arcing of components
- Shortening of component life

The MACC is tested to IEEE pulse standards and rated at 15A, 125V-AC, 60 Hz, 1875 watts continuous duty total for the console. A label on the unit describes the surge protection limitations.

## MACC Specs

| | |
|---|---|
| Alpha Delta Master AC Control Console | |
| Amperage | 15 |
| Volt (AC) | 125 |
| Hertz | 60 |
| Total Wattage | 1875 |
| Size | |
| MACC | 11" x 2-3/4" x 2-3/4" |
| MACC-4 | 5-1/2" x 2-3/4" x 2-3/4" |
| Shipping Weight | 4-1/2 lbs. approximately |

Alpha Delta Model MACC Systems are designed to reduce the hazards of lightning-induced surges. These devices, however, will not prevent fire or damage caused by a direct stroke to an AC line or a structure. Specifications, availability and price are subject to change without notice.

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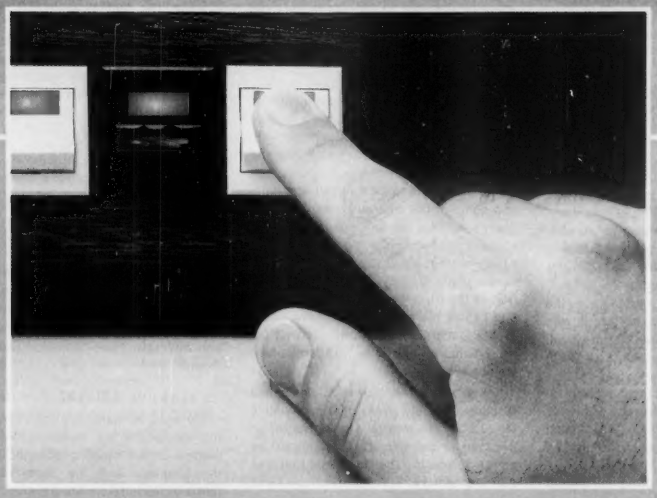
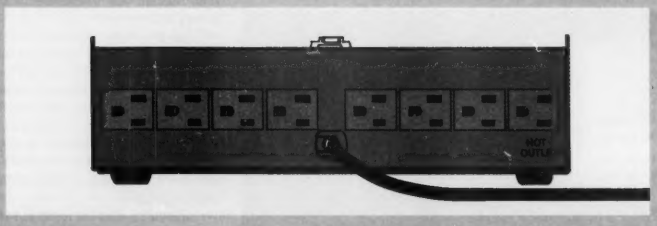
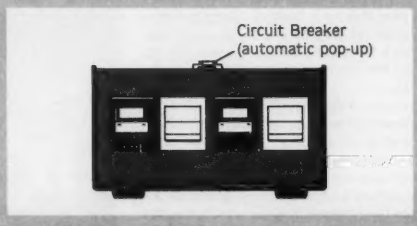


**The MACC is unique in voltage surge/transient suppression and convenient, desk-top individual component control. Nothing matches the MACC in value and performance. Put one on duty on your AC line.**






# MACC only $79.95
# MACC-4 only $59.95

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**The MACC-4** is a four clean-line output version of the MACC with all the same features. It gives you a cost- and space-saving solution for your application, without sacrificing performance. Rated a full 1875 total wattage. Includes master rocker switch, three independently switchable lines, one "hot" line and resettable circuit breaker.

# 73 INTERNATIONAL

*Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.*

*If you would like to contribute to your country's column, write to your country's correspondent or to 73:* Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*

## AUSTRALIA

*J. E. Joyce VK3YJ*
*44 Wren Street*
*Altona 3018*
*Australia*

In most countries, to varying degrees, amateurs are involved in emergency situations. We in Australia have an organization called Wireless Institute Civil Emergency Network, abbreviated to WICEN, that is set up as a community service in times of declared emergency situations. It is used also at several sporting events during the year as practice exercise.

However, in what we in the southern states of Australia called "The Holocaust of Ash Wednesday," practice turned to reality. It was a firestorm that spread from Adelaide in South Australia right through Victoria and up north to New South Wales—a distance of 800 miles. For us it fell, unfortunately, on the biblical Ash Wednesday, February 16th.

The states of the lower part of Australia were ripe for a bushfire. Being realistic, bushfires are a natural phenomenon here, as a lot of our trees and grasses will not germinate until bushfires have heated the seedpods to temperatures that would destroy imported trees and shrubs. The previous two seasons had been hot and dry, and on the morning of the 16th, we had a temperature of over 40° C plus strong winds of over 60 mph at some spots.

We had noticed minor bushfire smoke on the horizon during the working day but were not aware that in a few hours the whole state of Victoria with all its emergency services—and amateur radio in particular—would be put to the greatest test for decades. As you can imagine, with a country that relies largely on telephone lines strung between gum trees and wooden poles across open plains, it did not take long, once the fires got started, to burn down the gum trees and the wooden poles, leaving much of the state of Victoria with a communications problem. Added to this was the fact that most of our emergency services had only two or three crystal-locked channels of communications each.

It soon became clear that WICEN had to be activated to back up the overloaded communications systems of the authorities. Most amateurs had been monitoring the 2-meter repeater in their area and it was not long before literally hundreds of amateurs had volunteered to go mobile or set up base stations in the affected areas. All the 2-meter repeaters were taken over for emergency use in the Melbourne area, giving us a coverage of at least 100 miles all around Melbourne. Also, we had HF set up on 80 and 40 meters for those low spots that VHF could not reach.

By the early hours of Thursday morning, February 17, WICEN was in full swing, had organized amateurs as base-receiving stations, and had dispatched mobile stations with VHF, UHF, and HF capabilities to all the disaster areas.

The sights at some of these spots were horrific, with some of the smaller towns losing 100% of their buildings. More than 2000 dwellings were totally destroyed. The loss of stock went into the thousands, and it was a pathetic sight to see hundreds of dead or dying stock, some of the badly injured ones still wandering around waiting to be shot.

Upon arriving at some of the places we were to operate from in the early stages of the operation, the scenes were not much better, with people wandering around dazed, some of them with their clothes still smoldering. Large holes burned in their coats, dresses, etc., showed how close they had come to being casualties. Even though a lot of them had lost everything they owned, their main worries were whether fathers or some other relations or friends had survived in the next town, or perhaps only 10 miles away.

With the fires still raging and the phones mostly out of operation, it was here that WICEN operators, by now located at all disaster relief centers, could really help. Welfare messages were passed, and the looks of relief on faces when messages came back that relations or friends were alright made a lasting impression on the WICEN operators, some of whom had spent up to two days with no sleep.

Some of the places of operation were a bit hairy, to say the least, as some amateurs decided to stay in the path of the fire to relay messages. While some were set up in plush hotels with cold drinks and hot meals, others were out in the bush with cold sandwiches and hot drinks.

As a rough guide to the intensity of the fires, agricultural pipes buried two feet underground were melted and buckled beyond recognition; land that was previously flat had actually boiled and afterwards was left rough and uneven.

The wind created by the fires reached over 100 mph in some places. One instance we had reported from one of the worst-hit areas along the southern coast of Victoria was that people trying to direct traffic had to wrap arms and legs around the safety rails of a bridge to keep from being blown off.

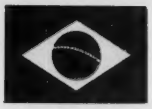
Another aspect of fires in Australia is that the same eucalyptus oil that gives relief to people all around the world is also released during the heat of the fires. It can form into fireballs that can be up to 50 feet across and can roll along, sometimes far in advance of the main fire front. There was a sad total of 70 lives lost in these fires over a period of 2 days.

The amateur involvement did not end with the fires. Amateurs later were asked to assist in "Operation Clean-Up," when councils from most country and city areas donated men and equipment to help the fire victims remove their debris so they could start to rebuild their houses and lives. As most of these bulldozers, front-end loaders, etc., did not have two-way communications, a control center was set up and approximately 150 amateurs gave their services either at control or out with the vehicles, directing them from one site of destruction to another.

A debriefing was held for all amateurs and some of the emergency services and the result, I feel, will be a greater degree of cooperation between all concerned in any future emergencies. Also, in the media coverage of the fires, there was a fair mention of the involvement of amateur radio, and I think the general public now has a greater understanding of the role that we, as amateurs, can play in community-service ventures.

The Wireless Institute of Australia has displayed proudly on the clubroom wall in Melbourne a plaque of appreciation awarded to them for the part played by amateur radio in "The Holocaust that was Ash Wednesday."

*This photo, taken 100 years ago, shows the first electric plant in South America, in Campos City. Equipment came from Cleveland, Ohio, to Campos City, the pioneer in using electric light services in South America.*



## BRAZIL

*Gerson Rissin PY1APS*
*PO Box 12178 Copacabana*
*20000 Rio de Janeiro, RJ*
*Brazil*

*Carlos Vianna Carneiro PY1CC*
*Rua Afonso Pena 49, Apt. 701*
*20270 Rio de Janeiro, RJ*
*Brazil*

### CW GROUPS

CW operation has had a gradual increase in Brazil the last five years, especially on the low bands. More on forty than on eighty, we can hear a dozen stations daily between 2100 and 0300 GMT, our after-dinner time. The establishment of more than twenty CW groups did this.

Sponsoring at least one beautiful award, CW groups have provided their members with the necessary incitement to be active in CW as much as possible. Their annual contests are successful and they receive more than 95% of the logs from the participants, even when they made only a few QSOs.

Since the beginning of "73 International," we have published, little by little, the rules of some of those CW awards. Now, after six months, we are happy to say that those groups which have had their award rules published have received many more applications for their awards from abroad. And the awards are not so easy, even for us!

### AWARDS

Regarding the rules of the CWRJ Award published in our column of May, 1983, please add to the CWRJ members list the following stations: PY1QN, PY1PL, PY1DUB, PY1VKA, PY1VMV, PY1ECL, PY1DWM, PY1TBW, PY1APS, PY1DMX, PY1KX, PY1QQ, PY1URQ, PY1ENW, and PY1VEC. They are all very active stations and will make it easier to work the CWRJ Award.

### LETTERS

We want to thank you very, very much for the letters we have received from readers of our monthly column. Besides the kindness and the most flattering terms of the letters, we are happy to know that readers are interested in Brazilian things and events.

One of them, Richard W. Randall K6ARE, collects old telegraph and wireless keys, and he is trying for one from each major part of the world. He wants an old key made in South America. The age does not make any difference, but it should be complete and in working condition. If possible, the key should be marked with the place it was made and the name of the company.

I have forwarded his letter to the CWSA CW group in the city of Santo Andre. Who can help Richard?

### WIPA AWARD

Sponsored by the Grupo Praiano de CW (GPCW), the WIPA Award is available to all licensed amateurs for confirmed contacts with 10 (ten) different cities which have international ports (harbors) in at least three continents. No more than two cities for each country. For example: in Brazil, the city of Santos and the city of Rio de Janeiro. Contacts must have been made after January 1, 1983, on any amateur band. Only two-way CW mode with a minimum report of (RST) 338. No QSLs. Send GCR list of stations worked (call,

date, time, band, mode, and report) and 15 IRCs for mailing expenses to GPCW, PO Box 556, 11100 Santos, SP, Brazil.

Endorsements: copper label for additional 5 (five) cities, silver label for additional 15 (fifteen) cities, and gold label for additional 30 (thirty) cities.

**de PY1APS**

### CAMPOS CITY AWARD

In 1883, a hundred years ago, using equipment coming from the Brush Electric Light Company, Cleveland, Ohio, for the first time in South America public electric light service was offered—in Campos, a Brazilian city in Rio de Janeiro State. Celebrating this event, Campos radio amateurs are sponsoring the Campos City Pioneer Award, as follows:

Available to all licensed radio amateurs, the award may be won by forming the sentence "1883-1983—Campos—Cem Anos de Iluminacao a Eletricidade. Pioneira na America do Sul (meaning 1883-1983—Campos—One Hundred Years of Electric Light Service. Pioneer in South America).

Use last letters of callsigns of stations reached to make the words. Contacts with two stations from Rio de Janeiro (PY1) are required, each one to substitute for one of the two dates (1883 and 1983). Contacts with stations from Campos City are valid as special QSLs to substitute for any missing letters.

Any band, any mode QSL is valid, mixed or single as well. Contacts made from January, 1983, on only. Do not send QSLs. Send log certified by amateur radio society or by two radio amateurs, stating name and call, date, QTR, report, band, and full address with zip code. Fee is 10 IRCs, and send request to Comissao Diploma Cent. Luz Elet., PO Box 391, 28100 Campos, Brazil, South America.

Submit the 62 needed QSLs in a column, in log, with the last suffix letters forming the sentence vertically.

### PY2AMI BEACON PROJECT

Since April 14, 1982, a ten-Watt beacon has been permanently operating from Americana, in Sao Paulo State, at 28.300 kHz, using this message—VV VV DE PY2AMI PWR 10W ANT GP LAT 22 45 S LONG 47 16 W AMERICANA SAO PAULO. Congratulations and reports are coming from everywhere for this first 10-meter QRP beacon.

The PY2AMI call is the Brazilian hams' league, LABRE, in Americana. It was granted to the three Brazilian radio amateurs who were responsible for the transmitter and the CW identifying call message: PY2VRX Carlos Felipe, PY2FUZ Jose Roberto, and PY2CRI D'Orsay.

Reports have come from all Brazilian states, from as far as SM4KRT (Borlange, Sweden), LU9DDQ (Buenos Aires, Argentina), VE3MBN (Ontario, Canada), DF5FP (Amselwg, Germany), F3HQ (Eaubonne, France); from the USA: WB1DLE, Massachusetts, N8CSR, Virginia, and KA2LEB, New Jersey; from EA8EY (Canarias Islands), GD3FLH/P (Isle of Man), GM3MHG (Ayrshire, Scotland), ZL1ATW (New Zealand), PA3BKS (Netherlands), G5AQQ (Romford, England), and many other places.

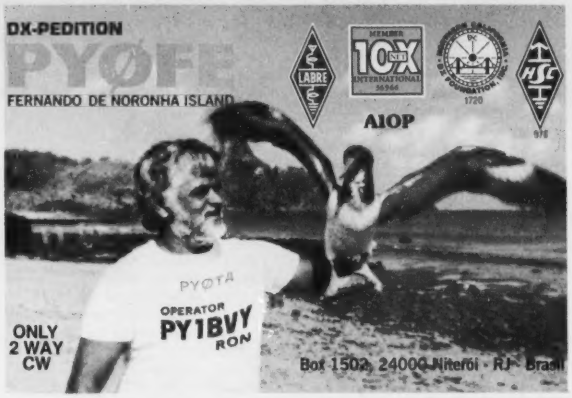
Keep an eye at 28.300 kHz and drop a QSL to PY2AMI Beacon Project, PO Box 31 or PO Box 108, 13470 Americana, Sao Paulo, Brazil, South America. Carlos Felipe, Jose Roberto, and D'Orsay will sure appreciate your report.

### QRP IN BRAZIL

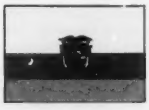
QRP operation in Brazil is getting a push, not only because of all the fun, not only because of new equipment and terrific prices, and not even because of its no-TVI advantages. QRP is growing as an immediate consequence of CW groups spread all over Brazilian territory, and even a QRP group was born from this, bringing to all radio amateurs (and especially to newcomers), love for CW operation. Easy-to-build transceivers and transmitters are a very strong call to the QRP world, especially in the CW mode.

What? Still talking about a no-code license? Why don't you think big? Why don't you try to be a "real" radio amateur and join all the fun?

**de PY1CC**




*PYØFE's QSL. Ron is really fond of CW operations as you can see easily from the number of CW groups he's tied to.*



## ECUADOR

*B. Patricio Recalde S. HC2PP*
*PO Box 511*
*Guayaquil*
*Ecuador*

Last July 11, at 0728 hours, there was an aviation crash in which 119 people died. The location was four kilometers from the airport of Cuenca, the third largest city in Ecuador.

By 0745, the SAR (Servicio ala de Rescate), had an emergency net operating on 40 and 2 meters.

With the cooperation of radio amateurs, the SAR, part of the Air Force of Ecuador (FAE), was formed last year.

The area of the accident was easily covered by three repeaters, two from the Cuenca Radio Club and the other one from the Guayaquil Radio Club. The amateurs from Cuenca were at the place of the tragedy within minutes, and the reports were that there was nobody alive. At 0810, Guayaquil sent radio equipment and one amateur, by helicopter. At 0800, there were military people with amateurs from Cuenca covering the place. The repeater that was used was monitored by HC5KA, who was handling all the communication. He assigned different places for emergency handling, hospitals, Red Cross, fire department, police, and military.

At 0915 another helicopter was airborne to Cuenca from Guayaquil, and then, successively, three small planes were airborne to Cuenca. At this time, we all got to know that there were no survivors, and then our task got very sad.

We began, on 40 meters, to call relatives in different parts of the country and to locate people who were supposed to be in that plane but apparently were not.

There was a call through 20 meters to England to tell to some people there of an Englishman who died in the accident.

At midday, the emergency was under control. The SAR had handled the emergency in an extremely organized way. But 113 dead! We hope that this kind of accident doesn't happen again.

## CANADA

*(Reprinted from the* CARF News Service Radio News, *No. 14/83, by permission of the Canadian Amateur Radio Federation, Inc.)*

According to reports from maritime amateurs, the DOC has taken action against a ring of illegal radio operators by seizing equipment and dismantling antennas in New Glasgow, Nova Scotia. Among the equipment seized was amateur gear modified to operate from 6 to 25 MHz. The group operates in and out of the amateur bands, with its own callsigns and QSL cards. Halifax amateurs reported that they were asked by the DOC to inform the Department of related "bootleg" activities. The enforcement action is being taken in cooperation with other countries. The DOC has not given out any details as the matter is still under investigation. Prosecutions will likely follow.

In what may be a spin-off from the recent sale of a Candu nuclear reactor to Rumania, Keith Jones VE3MH has received permission from that government to operate as VE3MH/YO in Bucharest. Keith, who works for External Affairs, was to have been on the 15-, 10-, and 20-meter bands since October 1st. The warm-up in diplomatic relations apparently resulted in this first such authority and also could account for two other firsts, both to Canadians—the issuing of a fishing license to one and permission to pursue his hobby of parachuting to another. It put Keith one up in the diplomatic community as even the US ambassador in Bucharest, who is an amateur, couldn't get the okay to operate there. Incidentally, Keith's good fortune is a one-shot special permission as there is no reciprocal operating arrangement between Canada and Rumania.

Scores of amateurs were present at the Royal Canadian Corps of Signals reunion and 80th anniversary ceremonies on Labor Day weekend in Kingston, Ontario. More than two thousand signallers, wives, and girlfriends participated in the three days of ceremonies, banquet, and barbeque. About a thousand veterans took part in the impressive march past, making a real good show considering it was forty or more years since they had left the Vimy Barracks training center.

Unfortunately, Canadian amateurs are spectators only in a situation which would affect them directly if the FCC proposal for a no-code license goes through. A militant group calling itself the "American CB Trucking Alliance" is pressuring US legislators for a far more permissive aproach to the code-free ticket than the one proposed by the FCC. The group wants all CB 11-meter operators eligible for amateur status in any new codeless license class. Most of this crew are operating illegally. US amateur organizations are meeting the FCC head-on in this one, with the perennial champion of the American amateur, Senator Barry Goldwater, leading the charge, with the assistance of other legislators.

Thanks to the assistance of the Minister of Communications, Francis Fox, three CARF handbooks are being translated into French, to be published by CARF in 1984. *The Regulations Handbook* is in the process of translation now.

Hopes may not be realized to have the ARRL DXCC list graced with a special prefix for St. Paul and Sable Islands, as they are based on the assumption that they are not under any provincial jurisdiction. They are, however, very much a part of Nova Scotia's territory, according to the federal Privy Council Office.

Regional Notes: Midwest—Norm Waltho VE5AE has taken over the VE5 QSL Bureau in addition to his other activities, including the "CARF Family Hour" on 3770 kHz at 0215 Zulu. Atlantic—Leigh Hawkes VE1ZN will be starting a CARF Regional Net soon. Ontario—Craig Howie VE3HWN, who has been very active in CARF, has resigned his directorship as he has moved to Calgary with a new job.

## CYPRUS

*Aris Kaponides 5B4JE*
*PO Box 1723*
*Limassol*
*Cyprus*

### NEWS FROM CYPRUS

On the 3rd and 4th of September, we had the National Field Day Contest. In this contest, three club stations took part: the Nicosia Club 5B4NC, the Larnaca Club 5B4LC, and the Paphos Technical School Club 5B4KX. Many amateurs helped in the setting up and operating of the stations, which shows that interest in amateur radio in Cyprus is growing.

All stations have sent me a report on their operations, and I start first with the Nicosia report which was sent to me by OM 5B4IT.

A few days before the start of Field Day, an initial scouting by 5B4IT and John 5B4MC around the capital, Nicosia, resulted in finding a nice hill called Kambia. Early in the morning of Field Day, 5B4NM (Marios), 5B4MB (YL Marianna), 5B4LP (Andreas), and 5B4MF (Spyros) went to the site and installed dipoles for 10m, 15m, 20m, and 40m. They also put up a 4-band vertical antenna. Around noon,

5B4MC and 5B4IT arrived with the rest of the gear, including a Sommerkamp FT-277 and a gasoline generator. Then the antennas were tuned and all was ready for the afternoon. All sat in the shade (temperature 35° C) and had a beer and a snack. 5B4MD (George) arrived in the afternoon bringing the last supplies of food and an IC-720 transceiver.

At 1800 hours, the contest started with MF first to operate. Around 2000, the fire for the barbecue was started, but the transceiver never stopped operating. At about 2330, 5B4BD (Antonis) became quite hungry and so the charcoal fire was started again. Nobody slept that night until very early in the morning when one by one, each in turn had a short nap. Breakfast was served by 5B4MD. During the contest propagation was poor, and a final total of 937 contacts was made. Everybody in the group enjoyed both the barbecue and the contest, but it is rather difficult to decide in which order.

The Larnaca Club activities were reported to me by the main leader of the group, 5B4GJ (Erricos). The installation of the tent and generator was done by 5B4EA, 5B4GJ, and their harmonics. The site was 3½ miles outside Larnaca City, by the seaside. Dipoles for 10m, 15m, 20m, and 40m were installed by 5B4DM and 5B4SP. Main operators for the contest were 5B4DM, 5B4JW, and 5B4SP. At the site, also present and helpful with operation, were 5B4EN, 5B4KY, 5B4FM, and 5B4AH, who repaired the transceiver which was used. Only 160 contacts were made due to poor propagation, and also the station was operated only until midnight Saturday and during the early morning on Sunday. According to Cyprus tradition, everybody enjoyed lots of food and drinks, such as wine, ouzo, beer, and whiskey.

The Paphos group reported to me via 2m that they set up their tent and station a few miles outside Paphos, by the seaside. The station was operated by 5B4JR (Andreas), 5B4JX (Sotos), 5B4MG (Dimitris), 5B4AI (Paul), who is also J28AI, and a group of pupils of the Paphos Technical School club station, 5B4KX. The Paphos group reports that they made around 450 contacts. So the Nicosia Club is the winner for this year's contest.

The Limassol group hopes to take part in the contest next year, and we generally hope that more Cyprus amateurs will be taking part in contests—not only local ones but also international ones.

## GREAT BRITAIN

*Jeff Maynard G4EJA*
*10 Churchfields*
*Widnes WA8 9RP*
*Cheshire*
*England*

### THE UK SCENE

I have mentioned before the problems of intrusion on the amateur bands by illegal operators. This has usually meant CBers moving up from the crowded 27-MHz band into the bottom of our exclusive 10m band. Recently a new menace has presented itself in the form of cordless telephones.

The UK has for many years had a very restricted and tightly-controlled state monopoly of telecommunications run by British Telecom (formerly The Post Office). BT's obsession with technical excellence and paperwork has long frustrated attempts to introduce modern telecommunications facilities (such as keyphones, call-distribution systems, mobile phones, electronic exchanges, and so on) for business and domestic use.

It is fair to say that BT has heeded the Thatcher government's desire for liberalization and competition with a more aggressive and commercial approach to its marketing. However, commercial pressures have led in the last couple of years to the widespread use of illegal telephone equipment.

Included in this category is the cordless telephone of the type consisting of a base station and remote hand-held or mobile unit. To provide full duplex communication, these crystal-controlled units operate on widely-separated transmit-receive frequencies. Most of the imported units are 1.6–2 MHz and 49.7–49.9 MHz, or 49.6–49.9 MHz and 70–70.5 MHz.

This causes interference to two amateur bands in the UK since, in addition to the international top-band allocation on 160m, we have an allocation at 4 meters (70 MHz).

With an estimated 10,000 illegal units operating in London alone and using powers up to 100-mW FM, the scale of likely interference is readily appreciated. A recent report compiled for the Radio Society of Great Britain by G3TCT has brought a measure of the problem to the attention of BT's Radio Interference Service. (Recent legislation provides for legal operation of cordless phones on 1.632–1.792 MHz and 47.45–47.554 MHz.)

### DECLINE OF UK CB?

As predicted by a number of pundits, the growth in the UK CB market has not continued. CB has not and is not likely to replace hi-fi or video as the dominant consumer electronics market.

A recent statement in the House of Commons by Alexander Fletcher, Secretary of State for Trade and Industry, pointed out that although 453,000 CB licenses were issued since legalization in November, 1981, only some 285,000 are still valid. The general impression one gets from the scale (or lack) of CB advertising and the demise of most of the street-corner equipment shops suggests that UK CB is no longer significant.

### NOVICE LICENSE?

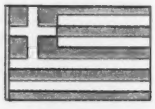
The government has again rejected suggestions that a Novice amateur license be introduced to allow code-free, minimum-technical-knowledge access to the amateur bands. It is felt that nothing should be done which would reduce the high standard of operating and technical proficiency shown to date by the Amateur Service. I doubt that few readers will disagree with that.

* * * * *

The RSGB breaks some new ground with the election of Bob Barrett as its president for 1984. As well as being Welsh and only in his early forties, Bob holds a class-B VHF-only callsign (GW8HEZ). Bob is the first class-B license holder to be elected for this high office.

Anyone contemplating a visit to the UK, or just interested in the latest happenings over here, might like to call the RSGB Headline News Service for some recorded comment. The number to call is 44 707 59312.

On the subject of telephone numbers, reference orbits (and other information) for UoSAT (OSCAR 9) can be heard on 44 483 61202.



## GREECE

*Manos Darkadakis SV1IW*
*Box 23051*
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*Greece*

In my previous column, I mentioned the new frequencies now in use by Greek amateurs.

By the time you read this, you probably will have heard some of them working around the new bands. On 160 meters, you may find Charlie SV0AA (ex SV0WTT). Charlie is an old-timer coming from the States but living permanently in Greece—for about 20 years now. He is well known among CW operators worldwide and he is really enjoying 160 fun with his brand new Corsair from Ten-Tec and a center-loaded vertical. Of course, Charlie is not the only one down there, but he is probably the only one on CW. (If I find a solution to the antenna problem, I will certainly join him.)

There are also some SVs on 30 meters and there will be more as soon as interest grows.

Finally, for you OSCAR enthusiasts, SV1OE and SV1AB are almost daily in AMSAT's new bird, offering both SSB and CW to the satellite DX chasers.

By the way, if anyone has a problem getting a QSL out of my fellow SV amateurs (including me) or needs a sked on some particular band/mode, I will be more than happy to help.

September and October are contest months, so as I write this many Greek radio amateurs are ready for the big events during these months. In a contest, not only can you upgrade your operating skill and represent your country, but also you can pick up some new ones, and this makes the effort very well rewarded.

So, antennas have been tested and tuned for optimum performance, radios have been checked, and arrangements have been made for the XYL and kids to spend a pleasant weekend at her sister's (or mother's) place away from the shack jungle where the cannibals will scream and yell at the microphone for 48 hours!

## INDIA

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*Cochin 682011*
*India*

### HIMALAYAN CAR RALLY

**Photos by C. P. Ravindranath**

The third Himalayan Car Rally was one of the toughest rallies in the world and therefore was indeed a challenge for the motorists. So was it also for the hams who provided communications for the organizers. They travelled over the most difficult tracks of the rally, along spine-chilling but beautiful mountain roads high up in the Himalayas.

Thirty radio amateurs from different parts of the country converged in New Delhi to take part in this hectic activity from 30th October to 6th November, 1982. While seven were stationed at the Communications Headquarters and six were mobiling on different legs of the rally, 17 were manning nine different base stations along the 4000-km track.

Communications Headquarters was located adjacent to the headquarters of the organizers in the Hotel Maurya Sheraton, New Delhi. It was manned by VU9AID Dasan, VU9BBJ Asu, VU9NKR Naresh, VU9RX Vasant, VU9TN Ram, VU9UK Kap, and VU9YY Rayu in three shifts, with the special call VU9HRY. Changing shifts every four hours, the station was operative on 80m, 40m, 20m, and 2m all the time. Three separate dipoles for the HF bands and a 12-element yagi for VHF, all on top of the 40-meter-high hotel roof, were powered by a TS-830S, Drake TR-7, Icom 720, and a host of VHF rigs.

VU9AIR Viji, VU9FD Dinesh, VU9HSL Homi, VU9KIT Chris, VU9NA Sasi, and VU9PCD Pradeep were manning the mobile stations en route. All of them, except VU9AIR Viji, started from Bombay and came to New Delhi where they branched off in different directions. All of them were operating throughout the rally, providing most valuable support. In fact, the most adventurous, daring, and back-breaking activity of all was that of the mobiling hams.

The base stations were located at Dehradun and Mussorie (VU9LT Ratna, VU9LR Satya, VU9BF Kalia), Nainital

*Starting cars being flagged off at the Parc Ferme. The ham operators are stationed right under the banner in the background.*

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(VU9SU Subi, VU9WC Sesha), Ranikhet (VU9KT Dilip, VU9VPR Vilas), Narkhanda (VU9VMJ Jadeja, VU9VRG Gopal), Manali (VU9MMA Mathew, myself), Simla (VU9SNM Subhandu, VU9XX Patil), Mandi (VU9SRJ Ramu, VU9POP Prakash), and Rai (VU9GSI Gurudev, VU9JSI Jasvinder), all along the route of the rally.

Originally, one more station was planned at Khoksar (10,000-foot altitude), but we had to cancel it since the rally itself went only up to Marhi, a little beyond Manali, due to snow-clad roads.

Most of the base stations were on HF bands. However, some operated both (Manali, Simla) and one VHF only (Narkhanda). The setup at each of the stations was decided on the basis of the survey done earlier by VU9RX Vasant.

VU9MMA and I were assigned to Manali, which was the northern tip of the rally route. At Manali the rally stopped for a night and returned from Marhi during the next day. So Manali was considered an important regrouping control point.

We were staying at the Hotel Beas, named after the snowy river flowing by its side. We had a trap dipole for 80m, 40m, and 20m supplied by VU9RX Vasant, which we put across the river (150 feet wide) at a height of about 80 feet above the water level. The other 40m and 20m combination inverted V, which I had brought along, was put up at the Parc Ferme (where the vehicles were parked for the halt), about 200 meters away from the hotel. The 3-piece, 12-element 2m ZL beam was moved around quite a bit whenever we needed it.

In spite of Manali being a very important control point, we had only one HF rig (Kenwood TS-130S) and one VHF rig (Icom IC-255A) to work with. Both of these were worked on an 80-Ah car battery which was under charge all the time.

The propagation conditions changed so rapidly that we had to keep on changing bands, one after the other, almost every hour. And very often, we had to get the assistance of hams in southern India to relay traffic. But generally 20m stayed good for the day and the other two bands were good during the night. Copy from Marhi on 2m was perfect throughout.

Until the cars started coming in on the night of November 3rd, we were operating from indoors, either relaying for some other rally station or handling traffic for the local regrouping control officials. But we had to stay outdoors almost the entire night once the cars came. And outside, it was really cold at 2° C. For many that may not seem cold, but for us who came in from far south, where the temperature varies only between 28° and 35° C, it was really very, *very* cold. There were many occasions while operating outdoors when we had to stop talking to breathe!

On our way back to New Delhi on November 5th, we also picked up VU9SRJ Ramu and VU9POP Prakash from Mandi, whom we had dropped there on our onward journey. In the prize-distribution ceremony (and later at the Rally Ball), to which all the participating hams were specially invited, the organizers commented on the excellent backup we all had provided for the rally. In fact, in their words, "We only organized the rally; the hams ran it!"

The whole communications network organized by the Federation of Amateur Radio Societies of India (FARSI) was steered by a committee headed by VU9AID (Chief Coordinator) and ably assisted by VU9RX Vasant and VU9TN Ram. In spite of all the difficulties with climate, food, and travel, all of us really enjoyed this activity and are looking forward to something similar again.

*VU9MMA Mathew and VU9ARL James standing outdoors where they set up the station.*

## ISRAEL

*Ron Gang 4Z4MK*
*Kibbutz Urim*
*Negev Mobile Post Office*
*85530 Israel*

In the last edition of this column, I reported on the Israeli VHF scene and mentioned Bruno 4X4DH's pioneering work with the first OSCAR satellites.

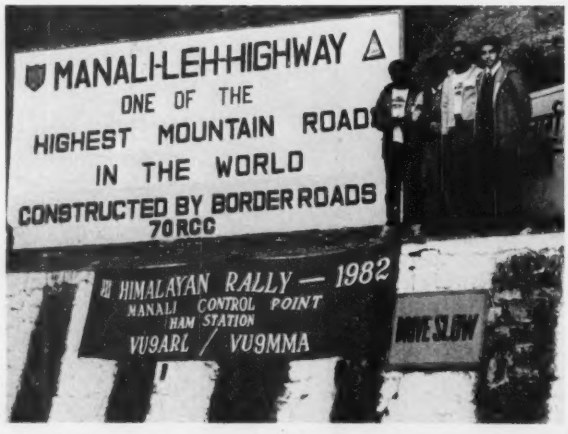
It is with pleasure that I can write that with the successful launching and operation of AMSAT OSCAR 10, Aharon 4Z4AG, Bruno's student from the Tel Aviv Club 4X4HQ in the class of 1966, was following in his footsteps on that historic afternoon of August 6th when the satellite's transponder was turned on. The other Israeli station making contacts through the bird was that of Abe 4X4IX.

Aharon, well known in ham circles here for his high degree of technical proficiency, had his Mode B station already standby on the day of the launch. His gear is largely home brew—the receiving converter, transmitting amplifier, and antennas. The 70-centimeter transmitter is a Kenwood TR-9500; for receiving he uses a crossed yagi, and he transmits on a helical antenna. Aharon wants to add a low-noise amplifier to his receiving setup to aid the weak signals. His elevational antenna rotator is also home constructed.

At the date of writing, 4Z4AG had contacted 30 countries through OSCAR 10, reporting that its apparent range from Israel is from New Zealand in the east to California in the west. California was contacted using at the time only ten Watts of CW, and the station sent him Hebrew New Year's greetings, to Aharon's great surprise! Aharon thinks that contacts with Hawaii may be possible, but only when the satellite is in a very particular position.

The amateur radio study guide, from the Open University's Center for Technological Education, mentioned here a few columns back, has at long last been published and been made available to the public. The book made its debut in August at the joint pavillion of the Israel Amateur Radio Club and the Center for Technological Education at "Youth City" in the Tel Aviv fairgrounds.

Along with a display of the CTE's educational wares—various courses and books in the technological fields—special-events station 4X4CET was operated around the clock. Interested visitors were given explanations and encouraged to sign up for the next courses to be given at 4X4HQ. Special mention must be made of Naomi 4X6DW for her efforts in setting up the station and coercing people to operate it!




*VU9MMA Mathew, VU9ARL James, and their friends just outside the hotel on the bank of River Beas.*

So, after two thousand years, the first ham study book has been published in the Hebrew language. Although this well-put-together and attractive work is intended only for the grade-C Novice ticket, it is so thorough that it gives a good background for the higher-class grade-B license. The Center, so it is said, has at present no intention of putting out a higher level course. Instead, they are making available a bibliography of their other books which cover the technical topics of the grade-B exam, such that the reader of the Hebrew language will not be left high and dry when he wishes to upgrade.

The IARC Events Committee has been busy making plans, including, in May, a world conference of radio amateurs to be centered around the Israel Independence Day celebrations. Arrangements are to be made with various travel agencies and the Ministry of Communications. When more details are available, they shall be rushed to *73*. In February, there is to be a national hamfest which will include the raffle of equipment and "junk" that was missing at the Annual Assembly. National Field Day is planned for the spring, March 20, 1984.

A new committee has come into being—the Contest Committee. Meeting at the QTH of Mike 4X6DF, they set for themselves the following aims: the creation of an Israeli worldwide contest, updating the rules of the Spring Contest (mentioned in the September, 1983, issue), liaison with the Ministry of Communications and foreign magazines, and the formation of a big guns all-star contest team to operate in the multi-multi class. Good luck in the contest!

On the social front, there have been meetings of both the Old-Timers, with Ozzie 4X4CW at the helm, and the Young-Timers, with Rami 4X6FH coordinating get-togethers. The Jerusalem Club, meeting on the first Thursday evening of each month, extends its invitation to all visiting amateurs. The profusion of visitors from abroad was so great at a previous meeting that the proceedings were conducted in English, under the capable leadership of Ben 4Z4ZA!

I have both good news and bad news for the seekers of the coveted Jerusalem Award. First the good news: Only 8 IRCs will be required instead of 10. Secondly, 4X4JW has informed me of the following changes: Seven contacts with Jerusalem shall be needed instead of five, and three additional contacts must be made with other Israeli stations. QSLs go to 4X6AA (Dr. Milt Gordon, PO Box 4079, Jerusalem, Israel).

To help you out with this difficult award, active Jerusalem amateurs include 4X4s JW, LH, LI, RL, SO, and WP; 4Z4s JS, SM, SW, US, ZA, and ZB; 4X6s AA, BM, CJ, CQ, and GH; G3ZCZ and WB6SZB, both portable 4X. There are probably others, but these are known to me as active on HF. Check out the high end of 20 meters SSB after 2100 GMT.

## ITALY

*Giancarlo Martelli I0XXR*
*Via Bevignani, 18*
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Nicola Sanna I0SNY, breaks his own world record from Ceuta, EA9, to Italy:

*Continued on page 134*

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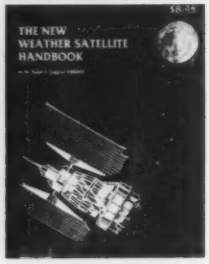


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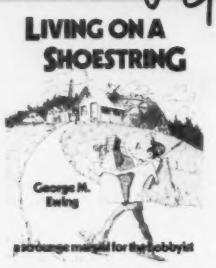


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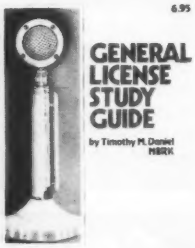


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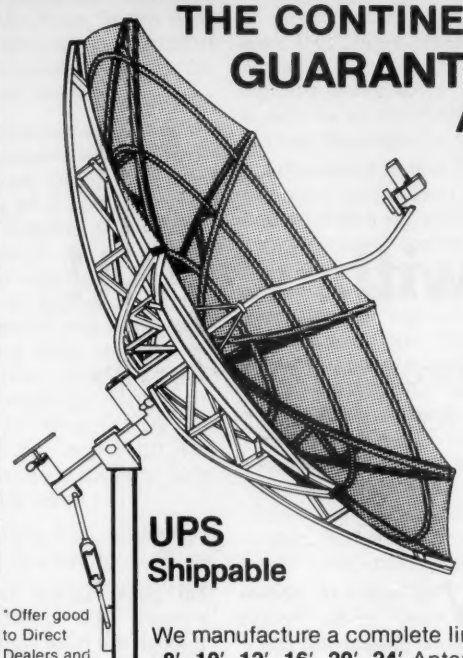

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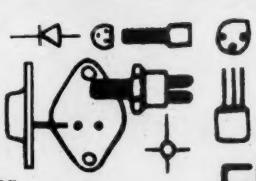

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# On the Move with 10 FM!

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*Seattle WA 98117*

*Andy and his rig.*

What aspect of modern ham radio could cause a 75-year-old "recycled teenager" to tumble back into a medium which devoured his spare time as far back as 1928? The excitement and freshness of FM on ten meters did it, coupled with the fact that you can carry by shoulder strap a totally portable station feeding 14 Watts rf into a 7.9-foot whip.

Owners of transceivers like the Comtronix FM-80 and Azden may benefit from my tinkering—which included adding a 2.5-mH rf choke where the hot mike lead enters the chassis, to kill audio squeal from rf entering the transceiver through the mike cord.

Discarding the whip which came with the Radio Shack CB kit (No. 21-941A), the ceramic cone and sturdy aluminum bracket gave me the necessary and secure antenna support. My FM-80 had two knurled screws on each side of the clamshell case, intended for U-bracket mounting under the dash. I used these screws and holes to fasten two suitably shaped 1/8-inch-thick dural plates to which not only the whip-mounting bracket could be fastened, but also the studs holding each end of

*Close-up of the rig.*

the Superscope tape-deck shoulder strap. In this way, no drilling of the clamshell was necessary except for the minibox mounting.

I experimented through a succession of whips to settle on a unit 7.9 feet long, consisting of a bottom section of 31 inches of 3/16" flexible aluminum rod, the upper end of which was threaded to fit an appropriate hole in the base of an 8-section telescoping whip, available for $.99 from Etco Electronics in Plattsburgh, New York. (Get on their mailing list; you'll not regret it!) This makes an extremely light, portable whip.

The heavy aluminum right-angle bracket (part of the ceramic cone insulator) was painstakingly rasped into shape and made to swivel through a short arc from a central hole with 10-32 thread screws into the dural plate. This allowed the whip to be vertical whether the FM-80 was shoulder-carried or operated from a card table outdoors.

A Bud CU-2102-B minibox was secured to the clamshell with 4-40 tapping and screws to hold the transmatch network—same as Ten-Tec's 247 unit. I settled for ten turns of No. 22 enamel on a 1/4-inch bakelite rod. The 100-pF (each section) 2-gang capacitor may be hard to come by, although Etco has one with 45 pF per section that will work (No. 151JK, made in England). I am actually using only about 40 pF each section for an excellent 1.1:1 swr into the whip.

I dismantled several Meissner mica compression padders to come up with one 100-pF capacity feeding the whip. It was a most pleasant surprise to find that the Radio Shack Micronta 3-way CB tester (No. 21-526A) of 10-Watt rating would handle our 14 Watts (up against the pin) with no sweat. Unfortunately, the coax fittings extended out the top surface. Identical holes were drilled and reamed out the bottom; fortunately, the PC board inside could be tipped so that its coax outlets were convenient for my use.

An swr reading should always be available while walking with this rig. Two access grommet holes in the minibox permit one to make corrections for minimum swr before starting out. Hold the mike to your face in the same attitude and the swr will remain low. When the rf power meter on the FM-80 falls to mid-scale in transmit, the nicads should not be discharged further; the receiver itself should be turned off. These batteries should never be totally discharged.

I have not regretted using the BP20A-11 nicad battery pack of 2.3-Ah capacity

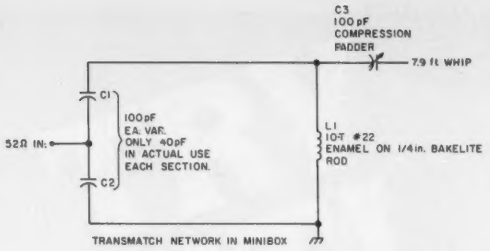
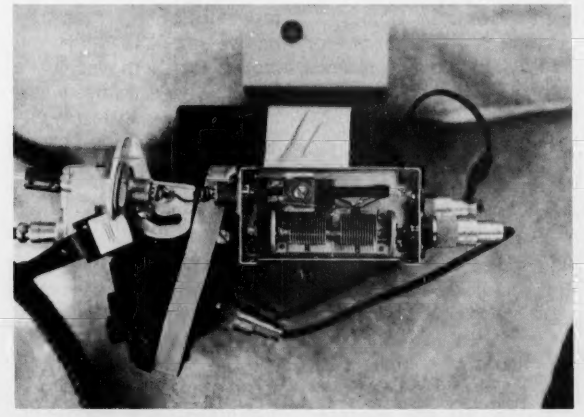



*Fig. 1. Transmatch network in the minibox.*

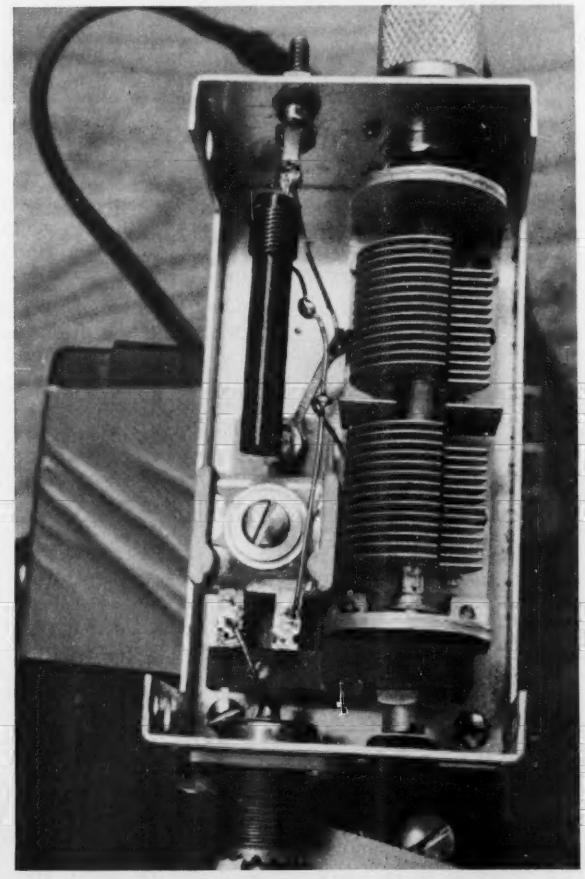
(from Alexander Mfg. Co. in Mason City, Iowa) and their 20-11 charger is guaranteed not to overcharge this unit. Fully charged in 10 hours, its 14 volts provides about three hours of operating fun. Silver duct tape secures the battery pack and swr meter case to the clamshell.

In passing, Azden/Comtronix-type transceivers intended for portable use will eventually have to go to LCD frequency/channel readouts since LEDs in daylight are useless.

While testing this unit in my basement workshop several feet below ground level, the whip lying horizontally, N4JB in Germantown, North Carolina, couldn't believe the circumstances for the boffo signal he copied! Operating it on a card table outdoors feeding a Cushcraft Ringo-10 right from the swr meter, the world is your oyster. See you on ten FM! ■



*The modification of the antenna-mounting bracket.*



*The transmatch innards in the minibox.*

*Dennis Sladen VE1BZJ*
*Site 16A, Box 4, RR #4*
*Armdale, Nova Scotia*
*Canada B3L 4J4*

# Thank You for Listening

*Build this simple speech expander and stop shouting. Your DX friends will thank you and the QSLs will roll in.*

A versatile little chip called an electronic attenuator and manufactured under the brand code MC3340P is the heart of this unit. When used ahead of my old war-horse—the Heathkit SB-401 transmitter—it certainly adds a few S units when trying to make a QSO through the QRM.

In Fig. 1, the MC3340 is shown being used as a basic remote volume control. The advantage of this circuit is that the remotely located potentiometer does not need cumbersome shielded leads directly connected to a sensitive mike or other low-level audio input. When pin 2 is held high (up to +6 V dc), the audio will be fully expanded—approximately 0-dB attenuation. If the voltage at pin 2 is brought down to 3.0 V dc, 90-dB attenuation is achieved. The control potentiometer, when varied between 4k and 30k, theoretically achieves the 0-dB-to-90-dB attenuation.

Based upon these premises, the speech expander/clipper came into being.

The input transistor, Q1, is a 2N3819 and, being an FET, serves as an excellent high-impedance buffer for the microphone and the MC3340. Transistor Q2 is a 2N1305 or similar transistor having a fairly good low-leakage coefficient. This transistor serves the purpose of dynamically varying the dc voltage at pin 2 of the MC3340.

The second chip, IC2, is a dual op amp, i.e., an LM358. Half the LM358 is used as an ac complex-non-inverting amplifier. The other half could be used to drive a VU meter or bar-graph display which can be used to monitor the audio output. However, the first half of the LM358 samples, through its pin 3, a portion of the audio output from pin 7 of the MC3340. Based upon the setting of R3, which controls the gain of the LM358, the sampled portion of the audio signal triggers a control voltage to appear at pin 1 of the LM358. This control voltage is rectified by D1 and fed to the base of Q2 which in turn controls the gain of the MC3340. Thus, the whole circuit acts as a sort of agc loop with R2 and R3 setting the attenuation thresholds.

Most of the parts are readily available at your local Radio Shack, except for the MC3340 and possibly the LM358, for which they may have no equivalent. Any op amp could be used for IC2—the only stipulation being that it must be able to work off a single-rail supply. The prototype unit that I built used an LM741, but it required two 9-V batteries to produce the dual-rail supply. I suppose the CA3140, which is said to have a better slew rate than the 741, could have been used with a single-rail supply. However, as far as I know, the MC3340 has no equivalent. Therefore, this IC will have to be obtained from a Motorola dealer.

The printed circuit board is fairly easy to lay out and etch and should be no problem to the regular constructor. In the Heathkit SB-401, the unit can be built inboard if the VU meter/bar-graph display is not included. The unit is more accessible with plenty of scope for expansion if built as an outboard addition, in which case the male and female replicas of the microphone connectors must be obtained.

Setting up the attenuation thresholds can be done accurately and quickly if a scope is available. If a scope is not available, plug the microphone into the input socket and clamp the leads of a pair of headphones between output connector and ground. (Do not plug the output of the unit into the transmitter.) Turn on the crystal calibrator of your receiver and adjust the audio output of the receiver for a high-pitch audio note. If the scope is available, connect it to the output connector of the unit.

Place S1 in the BYPASS position. Set R2 for minimum resistance from ground. Set R3 to minimum resistance. Set R1 to the halfway mark. Place the microphone near the receiver's speaker. If S1 has been connected appropriately, a weak tone should be heard in the headphones and a low audio trace should appear on the scope.

Now apply power to the unit and set S1 to OPERATE. If all has been connected well, you should get a significant increase in audio level at the output. Check the voltage at TP1 with a high-impedance voltmeter, preferably digital. It should

read 2.6 V dc. The voltage at TP3 should be zero or −Ve. This is the unit in full expansion mode.

Increase R3 until the voltage at TP3 goes positive approximately 1 volt. Check the voltage at TP1. It still should be showing +2.6 V dc and the scope should still be showing a healthy trace. A quick flip of S1 from OPERATE to BYPASS and back to OPERATE should show the amount of expansion.

With the voltage probe still at TP1, increase R2 until the meter shows +3 V dc. Now increase R3 until the meter reads +3.6 V dc. A reduction in the audio level at the output will be noticed and the trace on the scope will alter likewise. This is the clipping point.

If the audio source is abruptly increased and held at that level, or a loud long shout is emitted into the microphone, the result will be a sharp rise followed by a steep decline of the output signal to a constant level. This is most noticeable on the scope. The voltage at TP1 should show +4.5 V dc or higher (max. +5.2 V dc). This status is the unit in the attenuation mode.

When this has been achieved, speak at your normal level into the microphone and adjust R2 and R3 alternately until an accentuation of your voice from your normal speech level shows the peak briefly appearing and then being pulled down to the normal level. The aim of the adjustment procedure is to get that time constant between the peak and the pull-down as short as possible.

When this has been achieved, disconnect the headphones, turn off the crystal calibrator or audio source, plug the unit into the transmitter, and tune the transmitter into a dummy load. It will be found that the microphone gain control does not have to be turned up so much before the ALC cuts in. If a scope is used to monitor the transmitted audio signal, check and fine-tune R2 and R3 to suit your voice pattern and distortion threshold.

Get on the air and see how it works. Contact a distant station with the unit in OPERATE mode. Do not mention the unit, but in the course of conversation put it into BYPASS and wait for the reaction. Act accordingly.

I will be pleased to receive comments, enhancements, modifications, etc., concerning the unit and its operation.

In closing, I would like to thank G3YNB (H. Clayton) and VE1AOP (G. Coughlan) for getting me into redesigning the unit and writing this article. ■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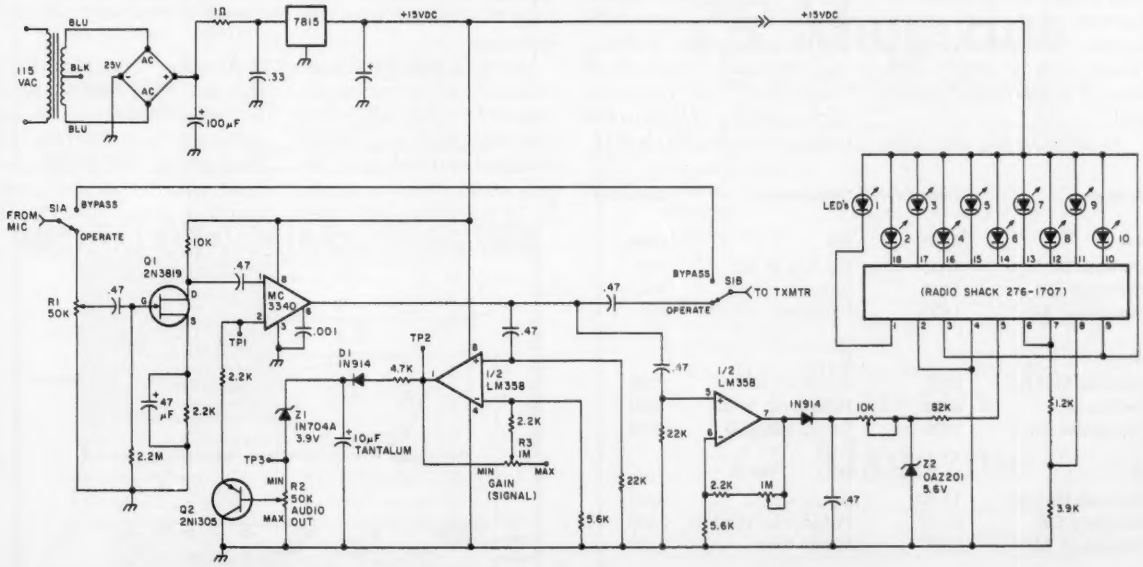


*Fig. 1. Speech expander/clipper with LED bar-dot display.*

Harry J. Ekelund WB2FYW
42 Pocantico Road
Ossining NY 10562

# Secrets of Nicads

*Nicad batteries will save you money. Or will they?*

You've been reading for years that nickel-cadmium batteries are the greatest thing since sliced bread for your portable gear. From one viewpoint, this is true, namely, economy. One set of nicads can be recharged many times before they have to be replaced, at a savings to the user every time they are recharged. However, there are some down sides to the use of nicads, some of which are readily apparent (lower terminal voltage, memory, downtime while charging) as well as one which is very important but not widely known: The capacity of a nicad is only about 25% that of a premium primary cell.

As an example, let's take the AA-size cell. The commonly available AA nicad has a capacity of 450–475 milliampere hours (mAh). Gould, GE, and Radio Shack cells fall into this range. A premium alkaline AA cell from Duracell, Eveready, or Ray-O-Vac has a capacity of 1700-1900 mAh or nearly four times the capacity of the nicad. Thus, it would be necessary to recharge the nicad cell four times before you achieve any economy.

But wait. There is more to this story. We all know about the memory associated with nicads. If not fully discharged before recharging, they have a tendency to "remember" the discharge cycle, limiting the life to the remembered discharge. Suppose you use your HT every day to and from work for a total drain of say, 150 mAh. You decide to put the charger on every night so as to have a full charge, right? *Wrong*. Unless you drag those batteries right down to nothing, a constant discharge/recharge of 150 mAh will result in cells with a capacity of about 150 mAh. Thus, you would have to recharge 12 times to obtain the same life as a set of premium AA cells. But that still represents some economy, doesn't it? Sure, if you are satisfied with less return on your investment than you expected.

Let's talk about the lower terminal voltage of nicads. They are 1.2 volts when fully charged. Eight cells (typical arrangement) will give you only a 9.6-volt power supply, vs. 12 volts from eight fresh premium alkaline cells. Some HTs will provide space for 10 cells when using nicads, and some dummy cells to be used with primary batteries, but then your economy is eroded further (10 nicads vs. 8 alkalines).

Now, your 12 recharges to recover your investment becomes 15. Still an economy, sure, but not the one you thought you were getting. And if you cannot use 10 cells in your rig, think about the lower outputs, both audio and rf, when operating at the lower supply voltage.

Another consideration that you should think about is charge retention. Nicad cells will lose 10–12% of their charge per month unused, whereas alkaline cells can lose about 10–15% of

| Primary | Capacity | Secondary | Capacity |
|---|---|---|---|
| **AA** | **mAh** | **AA** | **mAh** |
| Duracell Mn1500 | 1700 | Gould 0.45 SC | 450 |
| Eveready E91 | 1600 | Sanyo N450AA | 450 |
| Panasonic AM-3 | 1500 | Panasonic NR-AA | 500 |
| **C** | | **C** | |
| Duracell Mn1400 | 5000 | Gould 2.0 SC | 2000 |
| Eveready | 4400 | Panasonic NR-C | 1800 |
| Panasonic AM-2 | 3900 | Sanyo N2500-D | 2500 |
| **D** | | **D** | |
| Duracell Mn1300 | 10,000 | Gould 4.0 SC | 4000 |
| Eveready E95 | 9,100 | Panasonic N2500-D | 2500 |
| Panasonic AM-1 | 9,300 | Sanyo NR-d | 2500 |

*Table 1. Capacity of various batteries.*

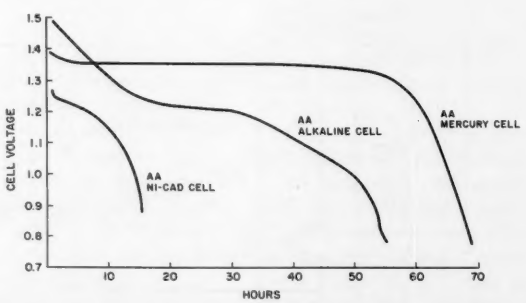


*Fig. 1. Cell discharge curves. 25 Ohms continuous discharge.*

rated capacity per year through shelf-discharge. Nicads are not the choice of battery to keep around in case of power failure, unless they can be trickle charged. You would be better served to keep a sack full of AA alkaline cells on the shelf for when the power goes off.

Fig. 1 shows the typical discharge curves for both alkaline and nicad cells. The curve for a typical mercury cell is also included for reference. AA mercury cells have a typical capacity of 2500 mAh, but cost nearly as much as nicads, thus are not cost-effective when compared to alkaline cells.

Table 1 is a listing of available primary and secondary cells with the manufacturer's ratings. Note the dramatic differences between cells and capacities.

Please note: I refer to *premium alkaline* cells. The LeClenche or zinc-carbon cell is *not* recommended for communications products for a myriad of reasons, one of which is capacity. Manufacturers of zinc-carbon cells typically publish no data on them because of their widely varying performance.

I am not saying that nicad batteries don't have their place, but in situations where it is important to keep a radio going over the long pull, when you can't recharge (no ac outlets in the woods looking for that lost child), or in foreign countries where your 110-volt charger will not operate, the premium alkaline cell offers many real, substantial advantages that cannot be overcome by nicads. ■

**References**


*Gould Battery Handbook*, 1973

Eveready Battery Engineering Data, 1976

Sanyo Cadnica Bulletin SF1542

Panasonic Sales Brochure 20M813/10M

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# The Edison Effect

*American inventor Thomas Edison is remembered for his array of electrical firsts. But lesser known is his invention of the first wireless telegraph.*

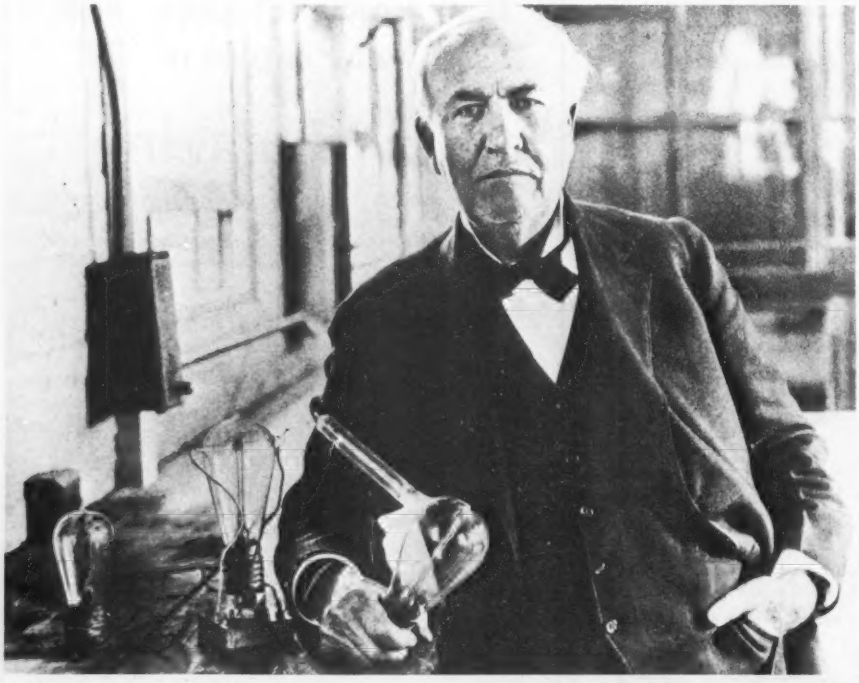
The contributions that Thomas A. Edison made to the electrical world were many and are fully recognized by today's historians. His genius as a top-notch inventor is well known internationally and he is justly credited to be the most prolific and important pioneer of the electrical age. The duplex and quadruplex telegraphs, the light bulb, the gramophone, the camera, and the movie projector are only a few of his inventions. There were many more, accounting for about 1,300 different patents at the end of his creative life.

But did you know that Edison also experimented with electromagnetic waves several years before Hertz did? . . . invented an inductive railroad telegraph? . . . invented a wireless electrostatic communication system? . . . discovered and applied the thermionic vacuum emission, creating, in effect, the first two-element tube rectifier?

In 1875, while experimenting with sound vibrations produced by a magnetic vibrator and ways to transmit them over wires to distant points, he noticed with curious amazement a peculiar light, or bright oscillating sparks, coming out of the core of the magnet. He had seen this phenomenon before in the telegraph relays and in loose filings between armatures and magnetic cores of telegraph printers, but so far attributed them to induction. These new sparks were somehow more intense and it occurred to him that they were not caused by induction. He wrote in his diary:

"We found that if we touched any part of the vibrator or magnet we got the spark. The larger the body of iron that touched the vibrator, the larger the spark. We now connected a wire to the end of the vibrating rod and we found we could get a spark from it by touching a piece of iron to it . . . by connecting to the gas pipe we drew sparks from it in any part of the room . . ."

He called this unknown electrical discharge "etheric force" or "etheric current" and conducted several randomly-directed experiments with it. It was not actually a discovery, since Joseph Henry noticed it much earlier, Faraday had speculated upon such a possibility before, and Maxwell had predicted it in 1823. Unaware of it at that time, Edi-



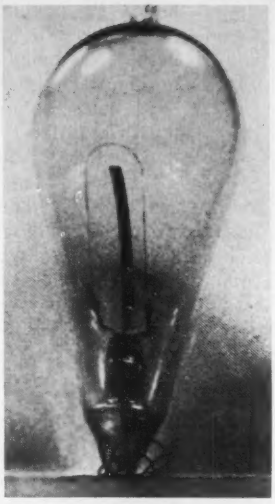
*Edison with some original Edison-effect lamps.*

son had been playing with electromagnetic waves.

In order to observe the new force, he constructed a "black box" with two adjustable sharp-pointed carbons and an eyepiece on top. He made public the results of his tests and since Edison was always news, the local papers reproduced his declarations, adding a bit of spice for good measure. Their words were something like this: "Mr. Edison discovered a new electric ray and predicts that someday all telegraphic and cable communications will be carried out without poles or wires. . ."

He demonstrated his black box and etheric forces to a scientific association in New York, which brought about a few congratulations and started a turmoil of opinions—both pro and con. The news traveled as far as Europe, and in England, physicist Sylvanus Thomson declared that all was based upon known electrical principles. Oliver Lodge, distinguished man of science and later a renowned wireless pioneer, discussed the experiments and arrived at the same conclusion. Edison did not pursue his investigations much further, perhaps resentful of being criticized by these known authorities, or maybe for the lack of a practical application for the forces; he continued his inventive career in the direction of "greener" pastures.

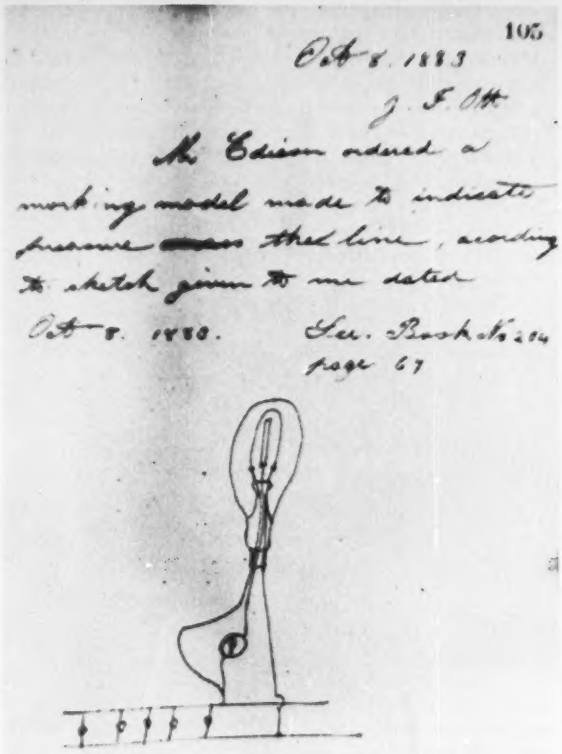
In 1880 we find Edison at work with a novel telegraphic system, which he called the "space" or "grasshopper" telegraph. He was assisted in this project by his good friend and colleague Ezra T. Gilliland. The idea was to provide a means of communication to train travelers in the long stretches of the western plains. It made use of a special telegraph line, strung on poles at car height on the opposite side of the regular telegraph line to eliminate the interference from them. The receiver employed an insulated metal plate on top of the car, connected in series with the secondary winding of an induction coil, and a telephone receiver. The circuit continued through the metal wheels and track to ground. The transmitter used a battery, a telegraph key, and a high-frequency buzzer, in series with the primary of the induction coil. A send/receive switch completed the installation.



*Close-up of an Edison effect.*

A duplicate set was to be installed at each telegraph office along the railroad line. The first tests were conducted on a small train in Staten Island NY and after a few failures and modifications, it was declared a success. Further experiments on the Lehigh Valley Railroad demonstrated the practicability of the grasshopper telegraph. It was never exploited and, although patented, apparently forgotten.

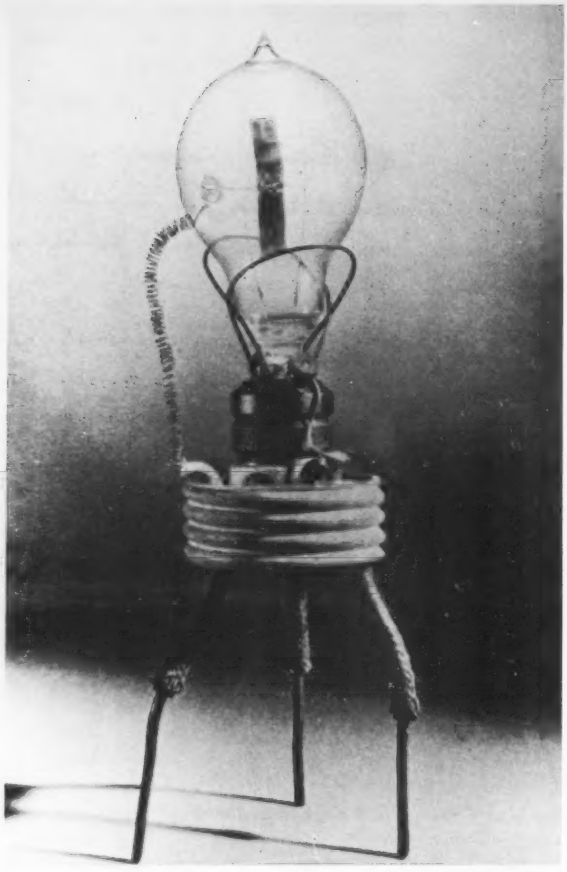
In 1855 at Menlo Park a wireless telegraphic system was developed by Edison. It used vertical masts of a hundred feet in length with metal plates on top. In his original patent he claimed to be able to communicate with points up to 3 miles distant and suggested that it could be installed on board ships, using their masts for the same purpose. He stated that communications between ships and between ships and shore could be established and collisions prevented during foggy days. As in the case of the grasshopper telegraph, the transmitter discharged an induction coil into the metal plate suspended on top of the mast. This induced a similar electrostatic charge on the plate of the receiving pole and the current thus created caused an audible click on the telephone receiver. It was never used commercially and when Edison was questioned about it, he declared with some air of mystery that, "It has been sold to a wealthy medium who wishes to communicate with the spiritual world. . ." According to records found later, it was discovered that he had sold the patent, which also included the grasshopper telegraph, to the Marconi Company in 1904 (patent no. 465,771).



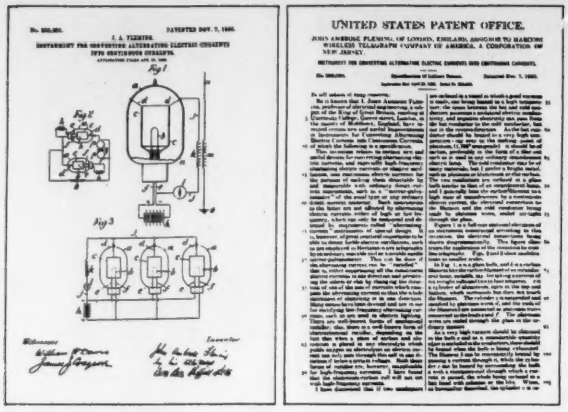

*Entry in Edison's notebook showing lamp connected as a voltage indicator.*

In 1880, while testing incandescent lamps, Edison observed that particles of carbon from the filament were "carried" and deposited on the inside of the glass bulb. He also discovered that after certain periods of operation there was a thin white line, similar to a shadow, parallel to the filament but to one side. The lamps were fed with direct current and it showed that this effect was caused on the side of the filament connected to the positive side. Notes were taken but shelved for future reference since his work on lighting and power plants required his full attention at that time.

Experiments done by other scientists some years before had proven that the air, when in contact with red-hot metals, showed



*One of the Edison lamps used by Fleming in early experiments.*



UNITED STATES PATENT OFFICE.

*Copy of Fleming's US patent for use of the "valve" in ac rectification.*

strange properties with regard to electrical charges. It was assumed (and sometimes emphatically affirmed) that electricity could not travel in a vacuum. Edison was aware of all these theories, but he never paid much attention to scientific assurances unless, of course, he could arrive at the same conclusions by experimentation. He was not a theoretician but a practical inventor. The question, "Was or was not the electricity the carrier of these particles of carbon?" was in his mind. He wanted an answer, he had to know and wanted to be sure.

Assuming that he installed another element inside the bulb and connected it to the positive side of the line, would it stop the flow of particles and keep the lamp clean inside? In 1882 he sketched a bulb with the added element, but it was not until the next year that he was able to spare the time to build and test the new lamp.

The second element consisted of a platinum wire suspended between the two filament legs and insulated by the glass. When it was connected to the positive side of the line, he found that a current flow was indicated in a galvanometer connected into that circuit, but when the new element was on the negative side, there was no current indication. He did many other experiments in order to determine the best size, form, and position of the second element and found out that the best shape was a flat metal plate installed between the filaments, without any electrical connection to any of them. The current thus obtained proved to be proportional to the incandescence of the lamp, or candlepower. This lamp was patented by Edison (patent no. 3,070,311) although its commercial use or application was vague at that moment.

What he created was in reality an electronic measuring device—the first one able to demonstrate that electricity, under certain conditions, could and would travel inside a vacuum. The reason why this truth was not fully understood at the beginning was that the nature of electricity was still a mystery, as far as electronic theory was concerned.

The lamp was shown at the 1884 International Electrical Exposition in Philadelphia PA and advertised as an indicator of incandescent voltages. Due to the lack of a better vacuum, the reliability was not of the first order. This time, however, Edison's discovery was received in a more favorable mood by the electrical elite. Visitors were frankly impressed by the tests conducted by Edison in person. The renowned professor Edwin J. Houston declared prophetically that "Edison's invention would become something of great importance in the future. . ." He was right. Sir William Preece, Engineer-in-Chief of the British Post Office, also an induction telegraph pioneer and later Marconi's protector and collaborator, who in the past had questioned some of Edison's electrical conclusions, visited the Exposition and was sincerely moved with the two-element lamp and acquired some of them for further study and evaluation. His conclusions were published in England and a paper about the subject was read at the Royal Society in 1885. He coined the phrase "Edison effect" in recognition of Edison's achievement.

Another well-known scientist, Dr. Ambrose Fleming, recently appointed electrical consultant to the new Edison London Lighting Company, obtained several of the two-element lamps, with the purpose of using them as indicators in generator circuits—without much success.

In 1897 the British physicist, J. J. Thomson, after experimenting with the lamps, concluded that the effect was caused by the emission of "electrons," or negative electricity, which flowed from the hot filament to the cold element or plate connected to a positive potential.

Edison did not pursue

these investigations much further and his discovery lay dormant for several years, that is, until 1904. At that time Dr. Ambrose Fleming—later knighted for his discoveries in the wireless telegraphic field—was employed as technical adviser by the Marconi Wireless Telegraph Co., Ltd., in London. Fleming was searching for a better detector to be used on the receivers manufactured by that company, since the magnetic detectors currently in use lacked sensitivity. He then recalled the tests that years before he had made with the Edison-effect lamps and concluded that they could be easily adapted for that purpose. He dedicated himself to investigating the lamp in scientific detail and to improving its operation, using higher vacuum and changing the plate to a cylinder surrounding the filament. He renamed them "oscillation valves" (this is why, in England, all vacuum tubes are still called valves) and applied for patents in England, Germany, and the United States.

Contrary to his claim, he did not invent the device, he simply used it as a high-frequency oscillation rectifier (it did not oscillate). Nor was he the first one to use it as a rectifier. Years later, as a result of litigations, his US patent was invalidated in favor of Edison's previous patent.

It did not matter very much anyway, since the Fleming valve did not make a great deal of difference as a detector of wireless signals. First, under the Marconi Company monopoly, it was supplied only to be used with their equipment and, second, it was less sensitive than the electrolytic and crystal detectors which appeared in the open market at about the same time.

We cannot deny that Dr. Fleming was a highly skilled and competent man of science who made abundant contributions to the wireless and later radio industry. His experiments with the two-element lamps revealed facts and set standards to be considered later in their manufacture. He drew up operational curves; he used new configurations, types of filaments, and shielding schemes, and was the first one to use them in conjunction with tuned circuits. But what really revolutionized the wireless art and converted it to "radio" (1912) was the addition of a third element or "grid" by Dr. Lee De Forest, which made the bulbs capable of being used as high-frequency detectors, amplifiers, and oscillators.

It has been said that Edison did not make any great scientific discovery, but by his skill, ingenuity, and power of observation, he was able to surpass in practical achievements many scientists with broad academic backgrounds. He was a real pioneer, perhaps the most important and imaginative of them all. He planted many seeds; others continued where he left off and a few collected the fruits. His work may not look like much to today's electronics students, where transistors, ICs, and computerized items dominate the industry, but it was the beginning—without it, radio, TV, and satellite communications would still be many years behind.* ■


**References**

*The Saga of the Vacuum Tube*, Gerald F. J. Tyne, H. W. Sams and Co., 1977.

*The Edison Era, 1876-1892*, Elfun Hall of History Publication, 1978.

*Edison, a Biography*, Matthew Josephson, McGraw-Hill, 1959.


*Other contributions made by Edison to the radio industry were the carbon microphone and the telephone receiver. The Edison battery was used as an emergency source on ships' radio stations.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| Noise Figure | less than 2.0 dB |
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| Input/Output impedance | 50 ohm |
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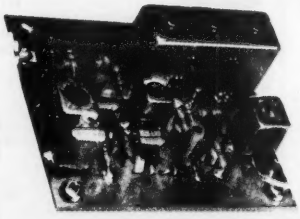
| Stock No. 40-01030 | $37.50* |



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| Noise Figure | 1.8-2.5 dB |
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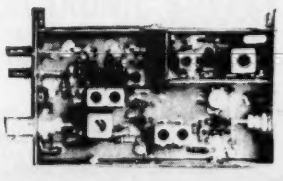
| Input/Output impedance | 50 ohm |
| Kit includes all parts, PCB and enclosure | |
| Stock No. 40-01433 | $38.50* |



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# CORRECTIONS

Due to an oversight, reviews from our August and September issues were not included in our 1983 Annual Index published last month. Below is a corrected version.

| TITLE | DESCRIPTION | AUTHOR | ISSUE |
|---|---|---|---|
| Advanced Computer Cont. | RC-850 Controller | WA3VUP | JAN 126 |
| AEA | CK-2 Memory Keyer | W1XU | FEB 104 |
| AEA | BT-1 Code Trainer | WB8JLG | MAR 104 |
| AEA | Moscow Muffler | W1XU | MAY 120 |
| AEA | MBA-RC Converter | N8RK | JUN 103 |
| AEA | KT-2 Keyer/Trainer | WB8JLG | JUL 120 |
| AEA | AMTOR TU | AF2M | NOV 98 |
| Alden Electronics | Facsimile Recorder | W1XU | FEB 102 |
| Autek Research | QF-1A Filter | WB8JLG | MAY 116 |
| Azden | PCS-4000 | WB8JLG | MAR 104 |
| Blacksburg Group | Fist Fighter | W1XU | APR 103 |
| Buckmaster Publishing | Call Directory | WB8JLG | FEB 106 |
| Commsoft | RTTY89 Program | WB8BTH | SEP 96 |
| Computer Applications | Pathfinder II | N8RK | JUN 104 |
| Connect Systems | Private Patch | AG9V | NOV 99 |
| Cushcraft | A3/A73 Tribander | AG9V | JUL 122 |
| DGM Electronics | SRT-3000 RTTY Terminal | AA6SC | AUG 118 |
| Dovetron | Widget | WB8JLG | MAR 107 |
| Electronic Rainbow Inc. | Satellite TV Receiver | WB9ZNU | JAN 126 |
| Foundation Publishing | The Rest of Ham Radio | N8RK | APR 104 |
| Galfo | Apple RTTY Program | AE5V | APR 104 |
| Gordon West | Code Tapes | WB8JLG | JUL 120 |
| Hallward Products | Rad. Elec. Buyers Guide | W1XU | AUG 120 |
| Harvey-Brain | Seychelles Saga | W1XU | JUN 104 |
| Heath Co. | Ultrapro CW Keyboard | W8DFI | SEP 94 |
| Heil Sound, Ltd. | HC-3 Mic Cartridge | WB8JLG | MAY 118 |
| Hy-Gain | TH7DX Tribander | K1XR | JUN 104 |
| Icom | R-70 Receiver | WA2VSN | FEB 102 |
| Icom | IC-490A Transceiver | K1KA | AUG 120 |
| Icom | TR-720 | W1XU | NOV 100 |
| Icom | IC-751 Transceiver | WB6TOV | DEC 109 |
| International DXers | Shortwave Equip. Review | AG9V | DEC 109 |
| James Anderson | Ghost Fighter's Guide | N8RK | OCT 110 |
| Kantronics | Hamsoft RTTY Program | WB8BTH | APR 102 |
| Kenwood | Panadapter | K1XR | MAY 116 |
| Kenwood | TS-430S | WA4BLC | JUN 102 |
| Kenwood | TR-8400 | K1KA | OCT 108 |
| Kenwood | TR-9500 | K1KA | NOV 97 |
| Larsen | Mobile Mount | WB8JLG | APR 102 |
| Metheny Corporation | LJM2KR Storm Alert | K9MX | JAN 128 |
| MFJ | Econo-Tuner | WB8JLG | OCT 110 |
| Palomar Engineers | PT-407 Antenna Tuner | WB8JLG | FEB 105 |
| QZX Newsletter | Newsletter | WB8JLG | AUG 120 |
| R.L. Drake Co. | 9000E Comm. Terminal | W6SWZ | SEP 90 |
| RSGB | VHF/UHF Manual | WB8JLG | JUL 119 |
| Santec | ST-uP Handie-Talkies | W2IVS | OCT 109 |
| Ten-Tec | Corsair Transceiver | W1XU | MAR 105 |
| Universal Electronics | RTTY Callbooks | WB8JLG | MAR 108 |
| Universal Software | Super-Ratt Program | N8RK | SEP 90 |
| W.H. Nail Co. | Egbert II Program | N8RK | SEP 95 |
| Yaesu | FT-102 | WB8JLG | MAY 116 |

In his article "The Magical Audio Filter" (November), Jim Pepper incorrectly states that the notch frequency of Fig. 1 varies directly as R4 and by the square root of C1 and C2. However, his formula indicates that the frequency varies inversely as B4 and inversely as the square root of C1 and C2. Thus, double R4 divides the frequency by two. Also, doubling either C1 or C2 reduces the frequency to .707 its original value.

**Boyd Skillin K6MGY**
**Fresno CA**

# SOCIAL EVENTS

*Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by* 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

### WEST ALLIS WI
### JAN 7

The West Allis Radio Amateur Club will hold its 12th annual Midwinter Swapfest on Saturday, January 7, 1984, beginning at 8:00 am, at the Waukesha County Expo Center Forum (take I-94 to Co. F, then south to FT, then west to Expo). Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 in advance (reserved until 11:00 am) and $4.00 at the door on a first-come, first-served basis. Delicious food will be available. For tickets or more information, send SASE to WARAC, PO Box 1072, Milwaukee WI 53201.

### SOUTH BEND IN
### JAN 8

A hamfest swap & shop will be held on Sunday, January 8, 1984, at Century Center, downtown on US 33 Oneway North between the St. Joseph Bank Building and the river, South Bend IN. Tables are $3.00 each in a carpeted half-acre room. The Industrial History Museum is in the same building. Four-lane highways lead to the door from all directions. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, 145.43, and 145.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616, or phone (219)-233-5307.

### SARASOTA FL
### JAN 14-15

The Sarasota Amateur Radio Association will hold its 5th annual Sarasota Hamfest on Saturday and Sunday, January 14-15, 1984, at the Exhibition Hall, 801 N. Tamiami Trail (US 41), Sarasota FL. The hours on Saturday are from 8:30 am to 4:30 pm and on Sunday, from 8:30 am to 3:00 pm. Donations, good for both days, are $3.00 in advance and $4.00 at the door. The swap-table donation is $12.00 for both days and includes the door donation. No one-day tables will be available and advance registrations are requested. Talk-in on 146.91/.13 primary and 146.73/.13 secondary. For advance tickets, booths, and tables, contact Dave Johnson, Jr. W4CCR, 2619 Forest Lane, Sarasota FL 33581, or call (813)-924-2525, or write Sarasota Hamfest, PO Box 3182, Sarasota FL 33578.

### RICHMOND VA
### JAN 15

The Richmond Amateur Telecommunications Society will hold its Frostfest '84 Winter Amateur Radio and Computer Show on Sunday, January 15, 1984, from 8:00 am to 4:00 pm, at the Virginia State Fairgrounds, Richmond VA. All events will be indoors and general admission is $4.00. Flea-market spaces are $3.00 and tables are available for $3.50. KX4Y will give Novice examinations. Doors will be open for unloading and setups beginning Saturday noon and a security guard will be on duty all night. Talk-in on 146.28/.88 and 146.34/.94. For more information, contact Bill Scruggs N4DDM at (804)-272-8206, or write Richmond Frostfest, PO Box 1070, Richmond VA 23208.

### YONKERS NY
### JAN 22

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Auction on Sunday, January 22, 1984, from 9:00 am to 3:00 pm, at Lempko Hall, 556 Yonkers Avenue, Yonkers NY. Admission for buyers and sellers is $3.00 each; children under 8 will be admitted free. New and used equipment will be auctioned and can be inspected from 9:00 am to 10:00 am. There will be plenty of seats and parking and the auction will start at 10:00 am sharp. Unlimited free coffee will be available all day. The club will charge a 10% commission on the first $100 and 5% on the remainder on successful sales only. Talk-in on 146.265T/146.865R and .52 direct. For more information, write YARC, 53 Hay-

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ward Street, Yonkers NY 10704, or phone (914)-969-1053.

**TRAVERSE CITY MI**
**FEB 11**

The Cherryland Amateur Radio Club will hold its 10th annual swap and shop on February 11, 1984, from 8:00 am to 1:00 pm, at the Immaculate Conception School Gym, 2 blocks south and 1 block west of the intersection of M-37 and M-22, Traverse City MI. Registration will be at the door. Talk-in on 146.25/.85. For more information, call Jerry Cermak K8YVU at (616)-947-4848.

**MANSFIELD OH**
**FEB 12**

The Mansfield Midwinter Hamfest/Auction will be held on Sunday, February 12, 1984, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets and tables, send an SASE to Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905, or phone (419)-589-2415.

**GLASGOW KY**
**FEB 25**

The annual Glasgow Swapfest will be held on Saturday, February 25, 1984, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow, just off highway 31E. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

**FRIDLEY MN**
**FEB 25**

The Robbinsdale Amateur Radio Club will hold its 3rd annual Midwinter Madness Hobby Electronics Show on Saturday, February 25, 1984, from 9:00 am to 3:00 pm, at Totino-Grace High School, 1350 Gardena Avenue NE, Fridley MN (a Minneapolis suburb). Admission is $3.00 in advance and $4.00 at the door. There will be manufacturers and dealers of ham, computer, satellite, and R/C gear, as well as seminars and a flea market. Talk-in on 146. 52 simplex or the 147.60/.00 repeater (KØLTC). For more information, contact Robbinsdale ARC, PO Box 22613, Robbinsdale MN 55422, or call Bob at (612)-533-7354.

**AKRON OH**
**FEB 26**

The Cuyahoga Falls ARC will hold its 30th annual electronic equipment auction and hamfest on Sunday, February 26, 1984, from 8:00 am to 4:00 pm, at North High School, Akron OH. There is easy access from the Tallmadge Avenue off-ramp of North Expressway (Rte. 8). Tickets are $2.50 in advance and $3.00 at the door. Some tables are available for $2.00 or sellers may bring their own; advance reservations are advised. Talk-in on .87/.27. For more details or reservations (please include an SASE), write CFARC, PO Box 6, Cuyahoga Falls OH 44222. Table reservations may also be made by calling Bill Sovinsky K8JSL at (216)-923-3830 and will be held until 9:00 am.

# HAM HELP

*We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.*

I need a schematic and manual for Lafayette FET multimeter #99-50833. I will pay copying costs.

**Keith Heryford**
**PO Box F**
**Cedarville CA 96104**

I would like to hear from anyone who has successfully interfaced a Commodore VIC-1525 printer to a Hal CT-2100 communications terminal either to the ASCII printer or RS-232C serial output of the Hal terminal.

**Karl Thurber W8FX**
**317 Poplar Drive**
**Millbrook AL 36054**

Our club station (VE2CLL) needs schematics and service manuals for the Hallicrafters HT-45 linear and P-45 power supply.

**Harold Carmichael VE2ELN**
**257 St. Leon St.**
**Quebec City**
**Quebec G1K 1B8**
**Canada**

I need an up-to-date tube-checking list for a B&K Dyna-Quik Model 500 tube tester. I have the list that is attached to the top of the case but I need a more modern list. The manufacturer says that it is out of print. Drop me a line letting me know what you have.

**Gene V. Mock W4RHD**
**Rt. 9, Box 64-5**
**Fayetteville AR 72701**

I need any and all technical information and manuals on the Central Electronics Model 100V transmitter. I also am interested in salvage units for parts. I will pay all expenses.

**W. Van Lennep**
**PO Box 211**
**Pepperell MA 01463**
**(617)-433-6031**

I need a copy of the tech manual/schematic of the Tektronix 535A oscilloscope. I will copy and return, or quote price for a good copy.

**Hank Dean N8DOE**
**408 Brisbane Ave.**
**Westerville OH 43081**

I would like to hear from anyone who has successfully changed the early Yaesu 101 6JS6 finals to 6146s.

**R. F. Bricker K4CSV**
**PO Box 295**
**Fort White FL 32038**


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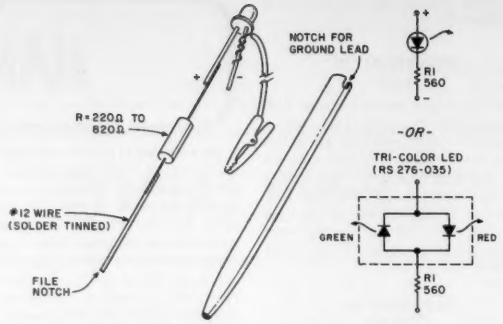
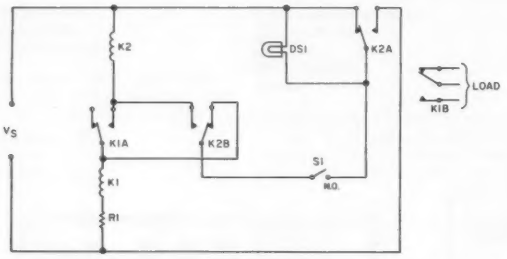
# CIRCUITS

*Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.*

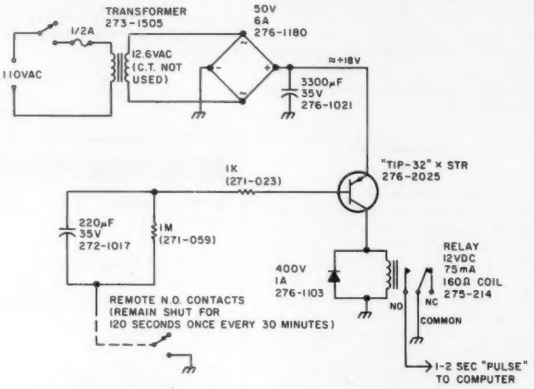
*In exchange for these technical gems, 73 offers you the choice of a book from the* Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices,* 73 Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



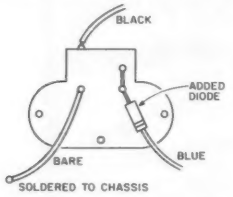

***WORLD'S CHEAPEST IC TEST PROBE:** The wire and resistor assembly should be about 4 inches long; work it into a ball-point pen case and glue the LED to the top. With a 560-Ohm resistor, this probe will handle up to 16 V.*—Jim Hyde WB4TYL, Waycross GA.




***RELAY FLIP-FLOP:** Here is a way to make two inexpensive DPDT relays act like an R-S flip-flop. One press of push-button switch S1 sets it; a second press resets it. Indicator DS1 shows when the circuit is set. Use contacts K1B to control the load. The two relays must have the same coil-voltage rating, which must be equal to one-half of the supply voltage, Vs. Choose R1 to reduce holding current if desired.*—Terry Simonds WB4FXD, Edgartown MA.

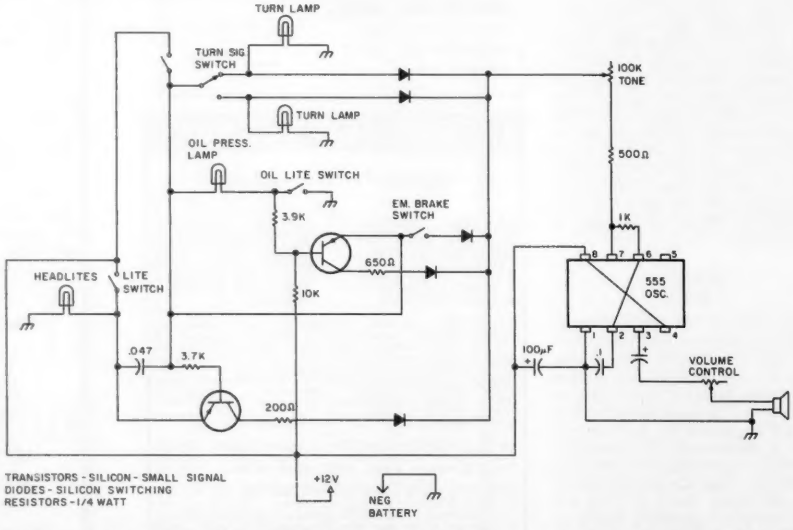



*REMOTE-SWITCH TIME LIMITER: This circuit will produce a 1-2 second pulse when the remote switch contacts are closed for any length of time. When the remote switch closes, the 220-uF capacitor charges through the base-emitter junction of the transistor. The 1k resistor limits the current flow. As the capacitor charges, the current drops off until the transistor stops conducting. The on/off cycling pulls the relay in and then drops it out again. The 1-meg resistor discharges the capacitor when the remote contacts open again.*—Jeffrey Blackmon W2YI, Beavercreek OH.




ENLARGED VIEW OF *EXT BACK UP* SOCKET AS SEEN FROM INSIDE CHASSIS

***MEMORY SAVER FOR THE KENWOOD TR-7800:** The Kenwood has nicad batteries to keep the memory intact when you unplug the rig. However, if you leave the power switch on when the rig is unplugged, the batteries will also try to power the rig—resulting in a very short memory life. To keep this from happening, first locate the blue wire connected to the "EXT BACKUP" socket. Remove this wire from the socket and insert a small diode between the end of the wire and the terminal to which it was formerly connected. The cathode end should be hooked up to the wire. Any small diode will do, provided it has no significant reverse current at 20 volts and as little forward resistance as possible.*—H. F. Viney VE3AZX, Nepean, Ontario, Canada.




***AUTOMOBILE EARLY-WARNING SYSTEM:** Hook this up to your car and you will never leave your lights on again. The circuit also provides an audible turn-signal indicator, as well as warns you when your emergency brake is on. Another connection to the oil-pressure light will tell you when the pressure is low.*—Keith Barrigar W7KQD, Lebanon OR.

# FUN!

*John Edwards KI2U*
*PO Box 73*
*Middle Village NY 11379*

## REPEATERS

This month's column is dedicated to the memory of WR2APG, a fine machine that died of neglect because it operated on 220 MHz instead of 2 meters. Funny, at the time I thought a repeater that specialized in RTTY, SSTV, and FAX would be successful.

## ELEMENT 1—MULTIPLE CHOICE

1) What is a station master?
   1) A brand of repeater antenna
   2) Slang for a repeater control operator
   3) The name of Motorola's repeater line
   4) A type of phone patch
2) In most ham applications, Motorola's HT-220 operates on:
   1) 50 MHz
   2) 145 MHz
   3) 220 MHz
   4) 440 MHz
3) The Private Line subaudible tone system was invented by:
   1) General Electric
   2) RCA
   3) Motorola
   4) Kenwood
4) In which year did the amateur 6-meter band open?
   1) 1968
   2) 1919
   3) 1923
   4) 1945
5) Who invented FM?
   1) Colonel Perkins
   2) Major Armstrong
   3) Captain Andrews
   4) General Stupidity

## ELEMENT 2—MATCHING

Match the past and present 2-meter transceivers with their manufacturers.

| Column A | Column B |
|---|---|
| 1) Carfone | A) Icom |
| 2) Brimstone 144 | B) KLM |
| 3) Marker-Luxury (ML-2) | C) Swan |
| 4) Voice Commander III | D) Azden |
| 5) HR-2A | E) Motorola |
| 6) Multi 11 | F) Yaesu |
| 7) FM-DX | G) Santec |
| 8) HW-2036 | H) General Electric |
| 9) IC-2AT | I) Tempo |
| 10) Metrum II | J) Kenwood |
| 11) PCS-4500 | K) RCA |
| 12) TM-201A | L) Satan Electronics |
| 13) 144uP | M) Heathkit |
| 14) GTX-202 | N) Clegg |
| 15) FM-2X | O) VHF Engineering |
| 16) VHF-1 | P) Drake |
| 17) TRX-144 | Q) Midland |
| 18) 1402 SM | R) FM Laboratories |
| 19) FT-221 | S) Genave |
| 20) 13-510A | T) Wilson |
| | U) Regency |

## ELEMENT 3—SCRAMBLED WORDS

Unscramble these examples of repeater terminology:

| | |
|---|---|
| RMMEJA | PUSR |
| TCHAPTOAU | PLUDXE |
| PERTREEA | TILSP |
| LENNCHA | QUELCHS |
| FOFEST | PIMXSLE |

## THE ANSWERS

*Element 1:*
1—1 Made by Phelps-Dodge and very popular.
2—2 Doesn't make much sense, does it?
3—3 Ever notice how many "subaudible" tones really aren't?
4—4 Hmmm. Just a couple of years before TV.
5—2 Major Edwin H. Armstrong, who later killed himself when the boys at the radio networks tried to cheat him out of his royalties.

*Element 2:*
1-K, 2-L, 3-P, 4-H, 5-U, 6-B, 7-N, 8-M, 9-A, 10-E, 11-D, 12-J, 13-G, 14-S, 15-C, 16-I, 17-O, 18-T, 19-F, 20-Q.

*Element 3:*
(Reading from left to right) JAMMER, SPUR, AUTOPATCH, DUPLEX, REPEATER, SPLIT, CHANNEL, SQUELCH, OFFSET, SIMPLEX.

## SCORING

*Element 1:*
Six points for each correct answer.
*Element 2:*
One and one-half points per match.
*Element 3:*
Three points for each word unscrambled.
How well do you repeat?
1-20 points—Have never ventured beyond 14 MHz
21-40 points—Think that 2-meter radiation is harmful
41-60 points—Use 2 meters when the CB is broken
61-80 points—Take your HT along on dates
81+ points—Hopelessly addicted

## AUTHOR'S CORNER

In these last few lines of this month's column I would like to respond to a point raised by Mark Regan of Reynoldsburg, Ohio. In a letter appearing in the August, 1983, "Letters" column, Mr. Regan claims that my comments in response to a "FUN!" poll question on religious nets proves that I wish "to deny the right of free speech to those who like to talk about ideas of a religious nature."

Not true, Mr. Regan. I certainly have no objection to bible discussions or any other sort of on-air religious activity that conforms to FCC rules. If my comment gave an anti-free-speech impression, as Mr. Regan asserts, I'm sorry. To set the matter straight, I believe in free speech for all.

# RTTY LOOP

*Marc I. Leavey, M.D. WA3AJR*
*6 Jenny Lane*
*Pikesville MD 21208*

Happy New Year! I don't know how long I have been waiting for this year to finally arrive. I guess it has been ever since I read the book—George Orwell's, that is. But this year seems no more frightening than last, even though the technology for some of Mr. Orwell's more frightening machinery does exist. Hopefully, however, we will use this technology for good, progressive communication.

We do have a touch of "newspeak," however. Ever hear of a CBBS? How about an ABBS, Tariboard, PMS, or other such cryptic phrase? To the computer buff, these bulletin-board systems (BBS) represent the "Citizens Band" (if you will forgive the expression) of computing. They offer a source of bulletins, a pipeline for programs, and a kind of public soapbox and maildrop that is available for the cost of a phone call. It shouldn't surprise you, then, that we hams have our own form of BBS on the air—usually called a RTTY mailbox system.

Made possible by any of a number of microcomputers, these versatile fusions of hardware and software create a kind of, well, let's call it a repeater, which can be called up, accessed, and used much as our computer buff's BBS can. But ours is on the radio, not the telephone!

I know that you all are interested in these systems, with a representative letter this month coming from Bob Wallace W9STA/2, in New York City. Bob writes, "Do you have any information regarding the RTTY mailboxes such as frequency, location, and how these things are accessed?"

Well, Art Santella K1VKO passes along the following information about one such system, the WA1GOO mailbox, in Rowayton, Connecticut. Art tells me that the system is on 146.580 MHz, twenty-four hours a day, idling at 60 wpm. A user accessing the machine can switch it to 100-wpm Murray or 110-baud ASCII. The machine covers a large area of Long Island and Connecticut, being located on the coastline of Long Island Sound. Operating simplex, with a Station Master antenna, Art tells me that plans are in the mill to raise the antenna to 100 feet, using a hardline feed, and a linear may be added to boost the output even more. Further down the line, a twenty-meter mailbox may be added, with a link to the VHF machine. This would give a super way to reach in and out of the Long Island area for local and DX stations.

A look at the directory on line recently shows about thirty files, including listings of computer nets, an RBBS directory, Miami weather frequencies, a W1AW schedule, various ARRL and other bulletins, several articles on RTTY and computers, and other items of interest. Even recent DX stations worked are listed, with times and frequencies, to aid other operators in their search for the rare country.

The system uses the Super-RATT™ software that we mentioned here a few months back. Some of the commands available include the ability to save or read messages on the system disk, scan recent news or weather bulletins, look at the user file, set mode to Murray code at 45 baud (60 wpm), 74 baud, 110 baud, or ASCII at 110 baud, even the ability to look at four analog-to-digital converters. I don't know what you would use that for!

If you are interested in this system, Art would be happy to send you a full list of commands and such. Just send a business-size SASE to Art Santella K1VKO, 43 Seaview Avenue, East Norwalk CT 06855, and ask for the information on the WA1GOO mailbox. Be sure to tell him you saw it in "RTTY Loop."

A look at the mailbox on my front curb produces this letter from Roy D. Thomas KA4VVJ. Roy would like to find a source for in-depth information on several of the microprocessor chips around. He relates having information on the 6800 (a fine chip!) but wants to learn more about the 8080, Z-80, 6502, and others. He also wants to know where you can buy any of these chips.

Well Roy, let's cover that last question first. Any good computer center or parts house should stock those CPU chips mentioned above, along with the support chips needed to build a functioning system. I would caution, however, that it takes a fair piece more than a chip and a power supply to make a computer. So, before you go out and buy a chip for ten bucks or so, it would do you well to read quite a bit and decide on just what you want to accomplish.

There is a raft of books out there, ranging from highly technical masterpieces of obfuscation to primers that spend hundreds of pages to teach a few elementary facts. The best bet is to read a few of the computer magazines which cover all bases, such as *Microcomputing*, and look at back issues, which should be in any reasonably sized library, to get a grasp on the hardware involved. In the ads in these magazines you will find a great number of books on microprocessors, and many of these books will be reviewed in the magazines as well. Look them over; I am sure you will find enough information to keep you busy for some time to come.

Above all, please realize that, with few exceptions, it makes little difference which microprocessor chip is ultimately used. How well and flexibly the software is written, how well the system, once configured, will do the task at hand, and what the upward compatibility is (will it become obsolete next year?) are all valid considerations.

A thank you to you all, the readers of "RTTY Loop," is sent along by way of Barry Travis N4FNZ. Barry, you may recall, needed a hard-to-find CRT for his oscilloscope. Well you all came through, and Barry is watching dancing green lines once again.

A new request comes from Henry Kirchmer KF4UW. Henry is looking for help in putting a Yaesu FT-107 on RTTY. He also would like to find a RTTY interface for the Timex/Sinclair 1000. I did not find any T/S-1000 interfaces in my review last month, Henry. But I am sure that any reader with information would be glad to drop you a note at 30 Patrick Lane, Rockledge FL 32955. Send me a copy, too, folks—thanks.

Another ham looking for help is Tom Childers WA5ZVZ. Tom has purchased a Teletype® Model 35 and plans to use it as a printer for his TRS-80C®. He is looking for help in connecting the loop supply of the teleprinter to his computer. Well, Tom, I have zip in the way of information on the Model 35; I am sure that at least one of our readers does, however, maybe even having hooked up the thing as you want to. If

so, I am sure that you will receive a note at 7189 Westbranch, Olive Branch MS 38654, very soon. If I hear anything here, I'll let you know.

In case any hams in the southern California area have never heard of SCATS (the Southern Counties Amateur Teleprinter Society), and I find that hard to believe, the club operates a two-meter repeater on 146.10/146.70 MHz, located in the north San Fernando Valley, and another repeater on 223.12/224.72 MHz on the Palo Verdes hills. These are Murray RTTY repeaters, open to all. The current president of the club is Sid Heyman WB6FFW. Interested amateurs are invited to drop a note to the editor of SCATTER, the society's newsletter, Hugh Washburn WA6IEX, 5772 Garden Grove Blvd., Sp 415, Westminister CA 92683, for more information.

I would like to take a moment to address a rather select group of readers. Any of you who are using 6800 or 6809 systems under the Smoke Signal DOS68 or DOS69 systems are invited to drop me a line with your name, address, and whatever system details you care to offer. I am looking to get a sense of how big the DOS68/DOS69 group is compared with the FLEX bunch, so that we can see some more of our system's stuff in print. Thanks.

As I have said before, I always enjoy hearing about your experiences with the newer RTTY equipment. This month, let me present one man's experiences. Ronald Kenneady N2DWN writes: "I have been reading 'RTTY Loop' for quite some time now and with the advent of computers, interfaces, printers, and solid-state rigs, I have finally decided to plunge in.

"And when I plunge in I *plunge in*! I've acquired a Kenwood TS130S, a Kantronics Interface, and a VIC-20 computer, along with the VIC dataset, disk drive, and dot-matrix printer. Right out of the box everything worked, except the interface.

"But, not to worry, the folks at Kantronics are great people and Mr. Travis Brann stayed on the telephone with me quite some time trying to figure out why every time I plugged in the computer-to-interface cord the Kenwood went into transmit mode. He finally decided that it must be a defective cable and said that he would send me a new cable.

"Not wanting to wait for the UPS truck, I pulled the cap off the game-port end of the connector and began to experiment. The wire-to-pin scheme that Travis Brann had given me said that I should be looking at the brown wire to pin 1, the red wire to pin 2, white to pin 3, green to pin 6, and black to pin 8. Not so and it's not Kantronics' fault! It's the connector itself. Pins 1, 2, and 3 (on the top side) are correct, however, on the bottom, it's a different story. The numbering order has been reversed. Therefore, by placing the green wire in the connector slot marked for pin 8 and the black in the slot for pin 6, all systems become a GO! The black wire in this cable is a double wire attached to shield, and therefore, somewhere along the line, to ground. Grounding pin 8 will activate the PTT circuit in the Kenwood and jump to transmit mode. If other hams are having problems of this nature they would do well to check the wiring to the pin in the game port.

"If you decide to use the Kantronics Interface, be careful with the operating voltage and current. If the input is not at least 12 volts at 1.5 Amps, it just won't work. If the interface can't pull enough current from the source, the entire bar graph and LED tuning light will light up and signals will not pass in either direction. Another hint for operation troubleshooting: All power must be on in order to operate. The monitor, computer, interface, transceiver, and printer (if attached) must all have power on in order to operate. Turn one of them off and the whole system will go down. According to Travis Brann it's a built-in feature."

Well, I really appreciate these impressions of the Kantronics unit, and I am sure that those readers considering putting a computer on the air do as well. I will try to cover more of the material you ask about in the coming months. Please remember, if you would like a personal reply to a letter, enclose an SASE. Thanks. So long for now—stay tuned for next month's "RTTY Loop."

# LETTERS

## WINNER!

In my opinion, your recent introduction of the "73 International" column has set your publication apart from all the others.

The use of correspondents "in country" makes the contents believable. The use of full-color national flags in the headings is a stroke of genius.

It seems to me that beyond the real service that this column provides to worldwide amateurs, it provides an insight to the correspondents' countries to the non-amateurs who may come across it. The Lord knows the world needs all the help it can get! Hope springs eternal that before long you will have correspondents in TA-, CN-, 4S-, 5R-, and perhaps even SP- and (dare I wish?) U-lands.

Finally, it is obvious that the inputs from some of the non-English-speaking correspondents have been *transliterated*, rather than *translated*. The difference is best illustrated by the line from the song: "Throw Mama from the train a kiss" (trans*lite*ration). The German when trans*lated* would be: "Throw a kiss to Mama from the train." To the thinking person, I believe this enhances the credence of the correspondents. Please don't edit them, except possibly for length.

Wayne, you have another winner!

**Thomas L. Bowers III WD4CQY**
**Eustis FL**

## OFF-BASE COLUMN?

I am not given to writing letters to the editor, but after reading a column in the August issue of *73*, I am moved to put in my two cents worth. The column I am referring to was part of "73 International" and was written by Roy Waite W9PQN concerning his views on amateur radio in Japan. . . and other non-related items.

Mr. Waite's comments made for interesting reading. Unfortunately, his statements were somewhat incomplete, incorrect, and outdated. Some were not even relevant to amateur radio.

There is a general statement that foreigners living in Japan often make that applies: Nothing in Japan is easy. It is a bureaucratic, red-tape, paperwork nightmare. It also makes for full employment! Mr. Waite attempted to tie Japanese procedures, rules, and regulations to the American way of doing business. That is like comparing apples to oranges. We have an outstanding country, but in my opinion, we have too liberal rules and regulations covering a wide range of rights accorded to visiting foreigners, both the legal and illegal type. But Japan is the subject here, not America.

First, it is not easy for a foreigner to obtain a license and permission to operate an amateur-radio station in Japan, but it can be done. The number doing so is quite large, surprisingly so. However, for the short-term tourist, it is almost impossible. Anyone having a valid amateur license issued by another country can apply for permission to operate on the correct form obtained from the Telecommunications Commission. The next, and often most difficult, step is finding a radio club that will allow you to use their club callsign. Only one individual at a time can use the club callsign. The other way for a foreigner to get on the air is to take the written exam in Japanese. Do that and you get your license and callsign like any other amateur. The last time I checked, the American exam was not given in Japanese—only English—so anyone who desires a regular American license must know our language.

In Japan, there are four classes of license: first class, second class, telegraphy, and telephony. First and second class can operate 100 Watts. The strict government inspection that Mr. Waite referred to plus the $100 charge are things of the past. JARL has been given the authority to inspect and approve 100-Watt (and for first class, up to 500-Watt) stations. The modern equipment used by most amateurs makes the inspection routine.

Much has been made by Mr. Waite and others of the large numbers of Japanese who hold the lowest-class license. They attempt to equate it to CB and a lack of technical expertise. Actually, this is not the case. The level of technical know-how among average Japanese amateurs is higher than that of the average American Novice. What is more important, technical ability and knowledge or the ability to copy CW at 12 words per minute (9 wpm for the second class, which is about equal to our General class)? In technical skills and knowledge, the holders of the lowest-level license in Japan are *not* Novices.

I also disagree with the statement that in Japan amateur radio is merely an extension of the Citizens Band, including its numerous abuses, bad manners, overcrowding, and lack of what amateur radio is all about. What is amateur radio all about anyway? It is a hobby. It is fun. It is communicating with others who enjoy the same thing. There is no requirement to do research or experiment or build homebrew equipment. The general consensus of opinion is that the more people involved with amateur radio (or any other hobby), the better off it is. More people involved means band crowding. It also means an increased likelihood of more experimenters and developers, more domestic equipment, a larger market, and a fresh infusion of "new blood" to prevent stagnation. I've heard my share of pileups and bad manners from English-speaking operators. One additional point needs to be remembered (and recognized): The holder of the license, even the telephony class, must clearly demonstrate technical knowledge. . . something that the stateside CB operator does not have to do. As a matter of fact, Japan has a new "sport band" in the 900-MHz range that requires no license. Putting CB up there makes more sense than in the upper HF range where ours is.

One small but important (to the few involved) aspect of amateur radio in Japan that was not covered by Mr. Waite is the KA callsign. Under an agreement between the governments of Japan and the US, amateurs who are stationed with the US military in Japan and who reside on a US military installation can be issued a special license and a KA callsign. The callsign consists of the KA prefix, a number corresponding to the part of the country where the radio is located, and by a two-letter suffix. The interesting part is that the operating privileges accorded the amateur are the same for the holder of the Novice-class US license as they are for the holder of the Extra-class ticket. In addition, they are expanded over what is authorized in the US. For example, KA stations are granted permission to operate voice from 14.000 to 14.350 and from 21.000 to 21.450. Therefore, the holders of the KA call can legally talk with foreign stations on frequencies well outside of those normally authorized. Even a Novice, something Mr. Waite seems to think is not worth much, can talk to his heart's content with any station outside of Japan on frequencies even a US Extra ticket holder cannot use. I'm sure that must rub some "real hams" the wrong way! The two noteworthy limitations to the KA callsign are: (1) the station must be fixed-base, no mobile operations allowed (and, of course, the station must be on a US facility), and (2) no contact with Japanese stations and no third-party ops are allowed.

Unfortunately, even though the KA callsigns are often listed in the callsign directory, many amateurs are not familiar with them and (1) think we are stateside or (2) don't realize that we can legally operate outside of the normal limits followed by US hams stateside.

One aspect of Mr. Waite's column that I objected to the most was the voicing of his opinions of the policies of the Japanese government. Japan is not America. His comments are best directed toward his congressman. I don't necessarily agree with many of the official or unofficial policies practiced by the Japanese government or the population at large. However, amateur radio is supposed to transcend politics. Describing the living place of the average Japanese as a "rabbit hutch" or "hovel" has no place in your magazine nor do discussions of his opinion of their attempts to protect Japanese domestic production. I have lived in Japan for the past six years and do not agree with his assessment of the living conditions of the local population. . . but my opinion really should not show up in print in an amateur-radio magazine any more than his should. We want to improve international relations and increase goodwill between hams, not torpedo it.

I hate to say it, but the July issue of that unnameable magazine, on page 60, gave a better summation of the Japanese license than did Mr. Waite. No politics or opinions, just the correct facts.

Thank you for your time.

**Cdr. William W. Radican N7CAD/KA2WR**
**San Francisco CA**

*I wouldn't want to say that I am more qualified to comment on amateur radio (or*

anything else in Japan) than Cdr. Radican after his six years in Japan, but I would think that my 20+ years in Japan, having associated with Japanese hams of all classes as well as foreign hams, might give me a slight edge.

Cdr. Radican begins his essay by stating that my statements were incorrect and outdated. No way! In rechecking the column in question, I find no misstatement of fact of any kind, nor is the information outdated. My friends in the JARL (including President Hara), Ministry of Posts and Telecommunications, and CQ Ham Radio wouldn't let me down. The only fact that has changed since the column appeared (which Cdr. Radican attempts but fails to explain correctly) occurred after 73 went to press. This was the change in the rule which eliminates station inspection for stations of 100 Watts or less (previously 10 Watts or less). And this was brought about only because the American side would not sign a reciprocal agreement that required a station to be inspected prior to issuance of a license. The JARL successfully negotiated that point with the very stubborn Ministry of Posts. It has now become more probable that a reciprocal agreement will be signed, but the Japanese side still wants to charge 7,000 yen per application (equivalent to about $28). This is not exactly reciprocity, or course, because as far as I know, most (if not all) of the major nations make no charge at all, or only a nominal charge at most. But maybe we can live with that. I am not sure the US will agree, though.

Cdr. Radican states that the JARL has been given permission to inspect first-class stations up to 500 Watts. Not true. The JARL has been given authority to waive inspections for any stations of 100 Watts or less (output power). Incidentally, inspections are not necessarily as routine as Cdr. Radican would have us believe. It depends on the inspector, the weather, if he likes the way you comb your hair, etc. Several of my Japanese friends have told me some hair-raising tales about these inspections. And you have to wait as long as six months for the inspectors to come before you can operate. A short-term visitor to Japan wouldn't even be here that long!

Cdr. Radican also states that "anyone having a valid amateur-radio license issued by another country can apply for permission to operate. . . ." Wrong! Only amateurs from America, Germany, Finland, and Ireland can do that.

Cdr. Radican states that all a foreigner has to do is to take the written Japanese exam, and if he passes it, he will get a license and callsign like everyone else. Wrong again! He will get only an operator's permit. The station and operator's license are separate in Japan. He still needs a friendly Japanese who is willing to lend a club callsign to him. But no callsign will be assigned to the foreigner. The club callsign is owned by the Japanese, and the Japanese is in charge. The foreigner only becomes a member of that particular club. Under Japanese law, only Japanese citizens can have a callsign. Four non-Japanese have taken the Japanese test and passed, but they still had to search for a club to operate from.

Cdr. Radican disagrees with the statement that in Japan amateur radio is an extension of the Citizens Band. OK, he can disagree if he likes. But that doesn't change anything. He ought to listen to 2 meters or 15 meters some night or weekend. Maybe he would enjoy the sex tapes played on the main calling channel, deliberate repeater blocking, another "ham" telling all who will listen that he is going to masturbate on the air as he goes through all the sounds, the jeers and mocking when two English speakers want to have a QSO, guitar playing, singing, etc. Does Cdr. Radican have his head buried in the sand?

Cdr. Radican refers to the Japanese Denwakyu (whom I properly called "Novice" operators, in English). There is no doubt that the Novice operators in Japan have in the long run added new numbers to the ham population, but perhaps Cdr. Radican does not know that 42% of these new operators fail to renew their station licenses upon expiration. Of those that do renew, upon the second expiration, ony 25% renew. After that, the rate continues downward. It is a case of diminishing returns. We have just a lot of people "passing through" the amateur gates and never returning after they tire of screaming and shouting and carrying on. The reason? No incentive. One can remain in the depths of the Novice world forever if he or she so chooses. Too easy to get in in the first place. Remember that anything acquired too easily is usually not cherished for long. Incidentally, many people think the large number of hams here has some real meaning, but actually, callsigns are never reissued; counting callsigns is futile, since many operators are counted who have long ago dropped out. No one knows for sure what the real number is.

Technical skills superior to the US Novice? Yes, the questions do seem on a higher level, but remember that they are multiple choice. Memory courses are run for these budding hams the year around.

I think Cdr. Radican is correct in his statement about the new 900-MHz sport band. It is a good idea. But I am not planning to cover it, as it is outside the realm of ham radio.

Now about the US military KA stations. I covered this in the October issue of 73. Cdr. Radican seems to think that Japan and America have an agreement permitting these stations to operate. Quite the contrary. The JARL and Ministry of Posts have made it known to Japanese hams that KA stations are not hams at all and have prohibited all Japanese hams from contacting them, subject to penalties. The agreement that seems to be confusing Cdr. Radican is the Status of Forces Agreement that allows the US military to establish military communications. It is for that reason that Japan considers KA stations to be military rather than ham stations. It is not a kind Japanese government that is permitting the American KA stations full-band operation, even for US Novices. Quite the contrary.

Cdr. Radican thinks that ham radio should transcend politics. No, not when it comes to reciprocity, unfortunately. This is the real world.

Cdr. Radican states that "Nothing in Japan is easy. It is a bureaucratic, red-tape, paperwork nightmare. It also makes for full employment!" So, from that statement, I gather that Cdr. Radican would have the US imitate Japan in this regard: more red-tape and paperwork nightmares, and we will have full employment. How simple life could be, indeed! It isn't possible that some of that red tape and bureaucracy is keeping American products out of Japan, is it?

Cdr. Radican reminds me that "Japan is not America." Yes, I've noticed.

Cdr. Radican mostly objects to the voicing of my opinions of the policies of the Japanese government. Why is that? Are we to be afraid of the truth in these matters? Are my comments irrelevant to amateur radio? They certainly are not. Mr. Nakasone, the Prime Minister of Japan, does not deny me my right to criticize the government. I have written two times to Mr. Nakasone and received replies from him both times. (He answers all of his mail.) I am a member of Japanese society here, pay my taxes (heavily!), and obey the laws. Of course, I complain, and I shall continue to do so. I praise many things here, too.

My comments about Japanese life, etc., are known as "perspective sketching," and it's useful to set things in proper perspective in order to understand why things are like they are. We must not hide from the truth. I will continue to tell the truth as long as I have the strength to do so.

Cdr. Radican tells us about the various classes of Japanese licenses, etc., but we know all of that already. I hope Cdr. Radican will read the September and October issues of 73 for a fuller understanding.

Those of my Japanese friends who have read my columns so far have congratulated me on "telling the full story," as they put it. They are looking forward to a reciprocal agreement with the US as much as I am.

I enjoyed reading Cdr. Radican's letter. I just wish he would get his facts straight and put a little more trust in me. Any column I submit to 73 has been checked and double-checked carefully before submission. Items relating to law were confirmed by one of the 12 Japanese (English-speaking) attorney colleagues in my office. Additionally, these columns have been read by a Japanese and an American ham for "reaction" before submission to 73. I feel I owe that much to the readers of 73 and to Mr. Green. I am not infallible, of course, but in rereading the columns I have submitted to 73 thus far, I find no errors. The columns stand. Cdr. Radican has struck out.

As for that "unnameable" magazine, all I can say is that my mother stopped dishing up pablum when I was one year old. Thereafter, I haven't cared much for it.

I am sorry Cdr. Radican didn't like my August column in 73. (Surely he won't care much for my September and October columns either.) Many people did like the columns, however, judging by my mail so far. Even my Japanese in-laws and my Japanese nephew (a budding ham) enjoyed the columns. Cdr. Radican's letter is the only negative voice I have heard.

I hope Cdr. Radican will continue reading 73 even though he doesn't find my writing to his liking. There is a large selection of fine features in 73 every month, and I think he will find many interesting articles among them, perhaps more suited to his taste.—Roy E. Waite W9PQN, Tokyo, Japan.

## ELECTRONIC LUNCH

If you go to a fast-service diner, order a *radio* for lunch. Short-order cooks call poached eggs on toast *Adam and Eve on a Raft*, sometimes served with *red lead* (ketchup).

A *radio* is a tuna-fish sandwich on toast. Does anyone know why?

**Carl S. Zelich AA4MI**
**Merritt Island FL**

## RELOCATED BEACON

Thank you for publishing the information on my ten-meter beacon. Unfortunately, due to the lead time for publication, the information was published after I moved. The KA1YE/B beacon has been moved to the Rochester NY area in western New York. It is about 10 miles south of the city at 43° 02' N, 77° 41' W, in grid square FN 13 of the Maidenhead grid locator system. The power is still 4 Watts, and the antenna is a dipole. The beacon is on 24 hours a day on 28.286 MHz CW.

**W. Keith Hibbert KA1YE**
**527 Rush-Scottsville Rd.**
**Rush NY 14543**
**(716)-533-1389**

# DR. DIGITAL

*Robert Swirsky AF2M*
*412 Arbuckle Avenue*
*Cedarhurst NY 11516*

### R. I. P., OSBORNE 1

I can still remember a QSO I had in April of 1981. There used to be a group of local hams that chewed the rag on 15 meters all night long. As usual, we were talking about computers.

The latest issue of *Byte* had just come out which, second only to receiving one's issue of *Kilobaud* (now *Microcomputing*), was the most interesting event in a computer hacker's life. (Hackers tend to lead dull lives.) In the editorial section, there was mention of a new computer: the Osborne 1. I commented to the guys in the net: "Did you see the new computer from Osborne? It certainly is an interesting idea!"

"Bob, I can't believe you fell for that," commented Marc WB2JUF. "That thing is nothing more than an April Fool's joke!" Everyone on frequency had a good laugh, and I conceded to Marc that I had been taken. After taking a close look at the picture of the Osborne 1, it looked as if it were a paste-up. And the silly things *Byte* said about it! Who in their right mind would want to put a computer under an airline seat?

After a few days passed and the *Wall Street Journal* carried a story on the unit, it became apparent that it was Marc, not me, who had been fooled. By now everyone knows the Osborne story. For a while they were extremely successful. The design which could have been taken for an April Fool's joke became a popular style of computer: the "transportable computer."

Unfortunately, Osborne didn't last. They announced their bankruptcy in late 1983. Competition became fierce, and mistakes were made and not corrected until it was too late. The death of Osborne also marked the end of another phenomenon: the "garage" computer. Now, with the big guns making personal computers, multimillion-dollar ad campaigns, and consumers looking for brand names when they go computer shopping, it will be next to impossible for an individual to start his or her own computer business. The shake-out has begun.

### WAKE UP, IT'S 1984

We finally made it to Orwell's infamous year. Will technology help us or ruin us? As computer hobbyists, we all have encountered anti-computer remarks and no doubt have been offended by them. How many times have you been told by a shop clerk that the computer "won't let" her do something. Or perhaps you experienced a delay at the

```
1 SOUND 1,0,0,0
2 SOUND 0,0,0,0
3 SOUND 2,0,0,0
4 SOUND 3,0,0,0
10 READ A,B
11 IF A < 0 THEN 400
20 HT = 894895 - A * 7
30 HT = HT / A
40 HT = INT (HT + 0.5)
50 LT = 894895 - B * 7
60 LT = LT / B
70 LT = INT (LT + 0.5)
100 HTH = INT (HT / 256)
110 HTL = HT - (HTH * 256)
120 LTH = INT (LT / 256)
130 LTL = LT - (LTH * 256)
200 POKE 53768,120
210 POKE 53762,HTH
220 POKE 53760,HTL
230 POKE 53766,LTH
240 POKE 53764,LTL
250 POKE 53763,230
260 POKE 53767,230
270 FOR T = 1 TO 125: NEXT T
290 POKE 53763,224:POKE 53767,224
300 GOTO 10
400 END
1000 REM : DATA STATEMENTS HERE
1010 REM : LOW TONE, HIGH TONE
9999 DATA -1,-1
```

*Program listing 1. Atari DTMF.*

| | 697 | 770 | 852 | 941 | 1209 | 1336 | 1477 | 1633 |
|---|---|---|---|---|---|---|---|---|
| 1 | X | | | | X | | | |
| 2 | X | | | | | X | | |
| 3 | X | | | | | | X | |
| A | X | | | | | | | X |
| 4 | | X | | | X | | | |
| 5 | | X | | | | X | | |
| 6 | | X | | | | | X | |
| B | | X | | | | | | X |
| 7 | | | X | | X | | | |
| 8 | | | X | | | X | | |
| 9 | | | X | | | | X | |
| C | | | X | | | | | X |
| * | | | | X | X | | | |
| 0 | | | | X | | X | | |
| # | | | | X | | | X | |
| D | | | | X | | | | X |

*Fig. 1. DTMF frequencies in Hz. Xs indicate tones for the digits and characters on the left.*

bank because "the computer was down." It's no wonder that some people seem to be against new technology. Amateur radio seems to be no different. I have received all sorts of strange comments from hams who object to the "strange noises" they hear coming from my station over two meters. Usually the objection is that the simplex frequency I am on (144.44) is for voice communications only, established by a gentlemen's agreement. To their comments, I can only respond that I am not a gentleman!

But by and large, hams are realizing that, in order to keep up with the world, a knowledge of computers is essential. In fact, computers are discussed over ham radio almost as much as the weather. I hope this trend continues.

One of the new things that computers have allowed is packet repeaters. Interest in this mode is gaining. It is nice to be able to use our spectrum more efficiently. Combined with mailbox facilities, a packet repeater is an excellent mode of communication. In the St. Louis area, packet radio is thriving. Pete Eaton WB9FLW, president of St. Louis Area Packet Radio, reports that "packet radio is growing rapidly. . .In the Midwest, as well as the rest of the country." His club publishes an informative newsletter, *SLAPR Protocol*. For more information about the club and the newsletter, write to: *SLAPR Protocol*, St. Louis Area Packet Radio Club, 1309 Gloucester Dr., Edwardsville IL 62025.

## ATARI DTMF

Atari home computers incorporate a built-in sound synthesizer. With commands from Basic, it is possible to make a wide range of musical notes and weird noises. As the tones are specified with an 8-bit (0–255) quantity, resolution is limited. For applications which require an accurate tone, a higher resolution is required. Atari realized that there might be a need for accurate tones and provided a way of creating them.

Atari sound is generated with a custom chip known as POKEY. Normally, one controls sound production from Basic using SOUND commands of the form SOUND a,b,c,d where a is the voice (1–4), b is the pitch (0–255), c is the distortion parameter, and d is the amplitude (0–15). The POKEY chip, however, serves other functions and has other capabilities which are not directly accessible with Basic statements. These functions can be used from Basic with the help of some POKE commands.

The program in listing 1 will generate the tones for DTMF signaling. Program logic is as follows: lines 1–4 serve to initialize the POKEY chip. All sound generation in the program is done with POKE statements, not SOUND statements. Lines 10 through 130 read in a pair of tone frequencies. From these numbers, a value is calculated which corresponds to a 16-bit integer. These numbers are split into two segments; since a byte can only hold 8 bits, 2 bytes are needed to hold the 16-bit number. The statement in line 200 tells the POKEY chip to link the sound generators in pairs: 0/1 and 2/3. Each pair becomes 1 voice that is controlled by a 16-bit (0–65535) number instead of an 8-bit (0–255) number. In addition, this POKE also makes the POKEY switch to a higher clock frequency, thus providing even more accuracy. The tones are actually switched on by lines 250 and 260. After a short delay provided by the FOR/NEXT in line 270, the tones are switched off at line 290. Line 300 starts the process all over again.

To enter the tone data, the frequencies must be placed on data statements. For example, if you wanted to have the computer "dial" the code *911, add the following data statements:

```
1500 DATA 941,1209
1510 DATA 770,1477
1520 DATA 697,1209
1530 DATA 697,1209
```

Those numbers are, of course, the tone frequencies used in the DTMF code (see Fig. 1 for the complete code).

This program can be used to create any tone that you may need. Accuracy is certainly good enough for any amateur-radio purpose. Simply put the tone frequencies you want generated on data statements. To generate single tones, eliminate the following lines: 50, 60, 70, 120, 130, 230, 240, and 260. Change line 10 to "READ A" and line 290 to "POKE 53763,224" And, of course, create your data statements accordingly. It should be possible to generate accurate RTTY and SSTV tones with the Atari—perhaps even to take a graphics screen and convert it into the proper SSTV tones. (Basic would be too slow for this; assembly language would be needed.)

For those of you who want to experiment with Atari sound, memory locations 53761, 53763, 53765, and 53767 will be of interest to you; they are the audio-channel control registers. The most-significant three bits determine the distortion parameter, the next bit is the "forced-output" bit, and the least-significant three bits are the volume-level bits. When the forced-output bit is set to a one, the output is controlled directly with the volume bit; the speaker can be set to any one of 16 positions. Using this bit, custom waveforms can be created.

Frequency is determined with locations 53760, 53762, 53764, and 53766. The value in these registers controls the frequency of the corresponding audio generator. When two voices are linked together, the locations are taken in pairs with the higher address taking the most-significant portion of the 16-bit number.

The way to coordinate tone generation is with location 53768. For our purposes, we would be concerned with bits 6, 5, 4, and 3. When bit 6 is set to 1, channel 1 is clocked with a 1.79-MHz frequency; bit 5 does the same for channel 3. Setting bit 4 high will join channels 2 and 1; bit 3 joins channels 4 and 3. These addresses were used to produce the tones for the DTMF routine. As you see, the Atari will allow for some elaborate tone generation.

I certainly appreciate all the mail I have been receiving. So far, I have received a few interesting proposals for an amateur-radio graphics standard— I would like to hear from some more of you on this matter!

# HAM HELP

I am converting a Teaberry Ranger T model 4012 CB rig for use on 10 meters. Can anyone supply a schematic or service manual?

**T. Sherwood WB8QGB**
**PSC Box 4852**
**SJAFB NC 27531**

I need manuals and schematics for the Yaesu YO-301 monitor scope and the Fire Bird F-200-M linear amplifier.

**Mario Biedoog**
**PO Box 560343**
**Suralco Dept. 53**
**Miami FL 33156**

I need the manual (or a copy of it) for the Hallicrafters SR-500.

**Doug Fonville**
**3805 33rd Street**
**Lubbock TX 79410**

Wanted: Two YD844-A desk microphones for Yaesu radios.

**John R. Bell KA9JYZ**
**3500-12th St.**
**East Moline IL 61244**

I need the following coils for a National SW3 receiver: 31A (20 meters); 33A (40 meters); and coil 32. I also need National XR6 coil forms and winding information.

**Walt Hill NM6L**
**Rt. 2, Box 323 Aliso Circle**
**Bishop CA 93514**

Wanted: schematic and manual for the Motorola model L43GGB-111OA. I would also like to hear from anyone who has converted this set to two meters.

**Ben Irvine N3CNH**
**Box 653 Blue Church Rd.**
**Coopersburg PA 18036**

# HAM HELP

Geloso (Italy) general-coverage (.5–30 MHz) receiver, model no. G.4/218 using 9 tubes—would anyone out there have a schematic?

Maverick 6m filter, 5-section adjustable, by Gavin Instruments, Somerville NJ—I need adjustment information on this TVI filter.

I will gladly pay postage and copying costs.

**John Sehring WB2EQG**
**PO Box 236**
**Oakland NJ 07436**

I would like to correspond with anyone who has converted a Bunker-Ramo Telequote MDS-7 or 2210 series computer I/O station to some practical use, e.g., oscilloscope, RTTY monitor, etc. I also need schematics for the Hewlett-Packard 400A ac VTVM, and Hal Communications 2550 keyer. I was also told that the circuit board has provisions for adding a memory function and would like information on this, if so.

**Barry Fuerst**
**218 Flournoy St.**
**Oak Park IL 60304**

I am looking for a manual for the CIR Astro-200 and a parts list for the Edgecom System 3000A.

**Jim Fyles WB8CZI**
**820 El Paso Blvd.**
**Denver CO 80221**

I would like to contact someone who knows how to convert the computer programs for the TRS-80 which have appeared in 73 into programs for the Commodore 64. I also need schematics for an Ampex stero amp: ASR 100, catalog #772-0056-01, s/n #5200445.

All copying and postage will be paid, but please notify me of costs in advance.

**DuWain Brundage**
**2316B Little Valley Ct.**
**Birmingham AL 35216**

I need manuals and schematics for the Hammarlund SP #600, the National NC #400, and the Collins R 390/URR (TM-0967-063-2010). I will pay for copying and postage.

**Raul L. Martinez KA4UAT**
**PO Boc 44-1707**
**Miami FL 33144**

I am looking for a service manual for the Panalyzer SB3 model T-200 panoramic adapter.

**Keats A. Pullen W3QOM**
**2807 Jerusalem Road**
**Kingsville MD 21087**

I would like to hear from anyone who can help me interface my VIC-20 to the Icom 720 transceiver. I would like to use the VIC-20 as a frequency controller and scanner.

**Robert F. Cann W4GBB**
**1606 Lochwood Dr.**
**Richmond VA 23233**

I am looking for information on how to install disco lighting in stereo speakers.

**Francis Turcotte**
**601 N. Tibbs**
**Indianapolis IN 46222**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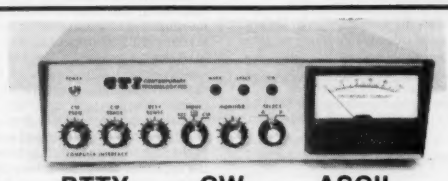

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# FCC

## Reprinted from the Federal Register

**Amendment of the Commission's Rules To Allow the Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service**

**AGENCY:** Federal Communications Commission.

**ACTION:** Final rule.

**SUMMARY:** This document amends FCC Rules to permit the use of Volunteers to prepare and administer amateur radio operator examinations. These amendments are necessary in order to maintain a viable examination program for amateur radio operators in light of FCC budgetary constraints. With a volunteer examination program, applicants will have more opportunities available to them to obtain amateur radio operator licenses.

**EFFECTIVE DATE:** December 1, 1983.

**PART 0—[AMENDED]**

1. The Table of Contents for Part 0 is amended as follows:

(a) A new § 0.484 entitled "Amateur radio operator examinations." is added.

(b) The Heading of § 0.485 is revised to read: "Commercial radio operator examinations."

* * * * *

2. A new § 0.484 is added to read:

**§ 0.484 Amateur radio operator examinations.**

Generally, examinations for amateur radio operator licenses shall be administered at locations and times specified by volunteer examiners. (See § 97.26(a)). When the FCC conducts examinations for amateur radio operator licenses, they shall take place at locations and times designated by the FCC.

3. Section 0.485 is revised to read:

**§ 0.485 Commercial radio operator examinations.**

Written examinations and International Morse code telegraphy examinations for commercial radio operator licenses are conducted at prescribed intervals or by appointment at locations specified in the Commission's current examination schedule, copies of which are available from any Commission field office or from the FCC, Public Service Division, Field Operations Bureau, FCC, Washington, D.C. 20554.

**PART 1—[AMENDED]**

4. The Table of Contents for Part 1 is amended as follows: the heading of § 1.925 is revised to read "Application for special temporary authorization, temporary permit or temporary operating authority."

5. Paragraph (a) of § 1.912 is revised to read:

**§ 1.912 Where applications are to be filed.**

(a) Applications for any class of new or upgraded amateur operator license shall be submitted to the examiners prior to the examination. (See § 97.26.) The examiners are required to submit the applications of persons passing their respective examinations to the Commission (for Novice Class operator licenses) or to the Volunteer-Examiner Coordinator (for all other amateur operator licenses). All other applications for amateur radio licenses shall be submitted to the Federal Communications Commission, Gettysburg, Pennsylvania 17325. Only one copy of the application is required.

* * * * *

6. The heading and paragraph (e) of § 1.925 are revised to read:

**§ 1.925 Application for special temporary authorization, temporary permit or temporary operating authority.**

* * * * *

(e) Upon successful completion of an Amateur Radio Service operator examination, an applicant already licensed in the Amateur Radio Service may operate his/her amateur radio station pending issuance of his/her permanent amateur station and operator licenses by the Commission for a period of 90 days or until issuance of the permanent operator and station licenses, whichever comes first, consistent with the rights and privileges of the higher operating class for which the applicant has passed the appropriate examination element(s), provided that the applicant retains the certificate(s) issued by the examiners for successful completion of the examination element(s) at the station location, and provided that the applicant uses an identifier code provided by a VEC as a suffix to his/her present call sign.

* * * * *

7. Section 1.934 is revised to read:

**§ 1.934 Procedure with respect to amateur radio operator license.**

Each candidate for an amateur radio license which requires the applicant to pass one or more examination elements must present the examiner(s) with a properly completed FCC Form 610 prior to the examination. Upon completion of the examination, the examiner(s) will immediately grade the test papers. If the applicant is successful, the examiner(s) will forward the candidate's application to: (a) the Commission's Gettysburg, Pennsylvania facility for an application for a Novice Class operator license, or (b) a Volunteer-Examiner Coordinator (VEC) for all other classes of operator licenses. The examiners will then issue a certificate for successful completion of an amateur radio operator examination. A VEC will forward the application to the Commission's Gettysburg, Pennsylvania facility.

**PART 97—[AMENDED]**

8. The Table of Contents for Part 97 is amended as follows:

(a) A new § 97.26 entitled "Examination procedure." is added.

(b) The heading of § 97.27 is revised to read "Examination preparation."

(c) The heading of § 97.28 is revised to read "Examination administration."

(d) A new § 97.29 entitled "Examination grading." is added.

(e) The heading of § 97.31 is revised to read "Volunteer examiner requirements."

(f) Section 97.32 and its heading are removed.

(g) The heading of § 97.33 is revised to read "Volunteer examiner conduct."

(h) A new § 97.35 entitled "Temporary operating authority." is added.

(i) A new Subpart I is added, as follows:

**Subpart I—Volunteer-Examiner Coordinators**

**General**

§ 97.501 Purpose.
§ 97.503 Definitions.
§ 97.505 Applicability of rules.
§ 97.507 VEC Qualifications.
§ 97.509 Conflicts of interest.

**Volunteer-Examiner Coordinator Functions**

§ 97.511 Agreement required.
§ 97.513 Scheduling of examinations.
§ 97.515 Coordinating volunteer examiners.
§ 97.517 Written examinations.
§ 97.519 Examination procedures.
§ 97.521 Evaluation of questions.
§ 97.523 Identification of applicants passing examinations.

**Authority:** Secs. 4(i) and 303 of the Communications Act of 1934, as amended, 47 USC 154(i) and 303.

9. Section 97.11 is revised to read:

**§ 97.11 Application for operator license.**

(a) An application (FCC Form 610) for a new operator license, including an application for change in operating privileges, which will require an examination shall be submitted in accordance with the provisions of § 97.26.

(b) An application (FCC Form 610) for renewal and/or modification of license when no change in operating privileges is involved shall be submitted to the Commission's office at Gettysburg, Pennsylvania 17325.

10. Paragraph (b) of § 97.25 is revised to read as follows:

**§ 97.25 Examination credit.**

* * * * *

(b) A certificate of successful completion of an examination will be issued to applicants who successfully complete an examination element. Upon presentation of this certificate for telegraphy examination elements 1(A), 1(B) or 1(C), examiners shall give the applicant for an amateur radio operator license examination credit for the code speed associated with the previously completed element. For purposes of examination credit, this certificate is valid for a period of one year from the date of its issuance.

* * * * *

11. A new § 97.26 is added to read:

**§ 97.26 Examination procedure.**

(a) Each examination for an amateur radio operator license shall be administered at a location and a time specified by the examiner(s). Public announcement before examinations shall be made for elements 1(B), 1(C), 3, 4(A) and 4(B).

(b) The examiner(s) must be present and observing the candidate throughout the entire examination.

(c) The examiner(s) will be responsible for the proper conduct and necessary supervision during each examination.

(d) Each candidate for an amateur radio license, which requires the applicant to pass one or more examination elements, must present the examiner(s) with a properly completed FCC Form 610 on or before the registration deadline date for those examination sessions for which registration is required; otherwise, applicants shall submit FCC Form 610 at the examination session before the start of the examination(s). In cases where a registration deadline is required, it shall be specified by the VEC that issues the examination papers to the examiner.

(e) The candidate shall comply with the instructions given by the examiner(s). The examiner(s) must immediately terminate the examination upon failure of the candidate to comply with the examiner(s)' instructions.

(f) At the completion of the examination, the candidate shall return all test papers to the examiner(s).

(g) A candidate whose physical disabilities require special procedures to allow participation in examination sessions shall attach a statement to his/her application. For examinations other than Novice Class the statement shall be retained in the files of the VEC that issues the test papers. The statement for Novice Class examinations shall be retained by the examiner for one year. The statement shall include:

(1) A physician's certification indicating the nature of the disability; *and*

(2) the name(s) of the person(s) taking and transcribing the applicant's dictation of test questions and answers, if such a procedure is necessary.

(h) An applicant who fails an examination element required for an amateur radio operator license shall not apply to be examined for the same or higher examination element within thirty days of the date the examination element was failed.

12. Section 97.27 is revised to read:

**§ 97.27 Examination preparation.**

(a) Element 1(A) shall be prepared by the examiner. The preparer must hold an Amateur Extra, Advanced, or General Class operator license. The test shall be such as to prove the applicant's ability to transmit correctly by hand key and to receive correctly by ear texts in the international Morse code at a rate of not less than five (5) words per minute. (Special procedures may be employed in cases of physical disability. See § 97.28(g).) The applicant is responsible for knowing, and may be tested on, the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, AR, SK, BT and DN. (See § 97.29(c).)

(b) Elements 1(B) and 1(C) shall be prepared by the examiners or be obtained by the examiners from the VEC. The preparer must hold an Amateur Extra Class license. The test shall be such as to prove the applicant's ability to transmit correctly by hand key and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed. (Special procedures may be employed in cases of physical disability. See § 97.28(g).) The applicant is responsible for knowing, and may be tested on, the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, AR, SK, BT and DN. (See § 97.29(c).)

(c) Element 2 shall be designed by the examiner from PR Bulletin 1035A (latest date of issue), entitled *Questions for the Element 2 Amateur Radio Operator License Examination.*

(d) Elements 3, 4(A) and 4(B) will be designed by the FCC. The FCC will select questions for each test from the appropriate list of questions approved by the Commission (either PR Bulletin 1035 B, C, or D, latest date of issue). The FCC will provide each VEC with current examination designs. The VEC is required to hold current examination designs in confidence.

(e) PR Bulletins 1035 A, B, and C and D will be composed of questions originated by the FCC and questions submitted by amateur radio operators in accordance with the instructions in the Bulletin. Amateur radio operators holding Amateur Extra Class licenses may submit questions for any written examination element. Amateur radio operators holding Advanced Class licenses may only submit questions for Element 2 and 3. Amateur radio operators holding General Class or Technician Class licenses may only submit questions for Element 2.

13. Section 97.28 is revised to read:

**§ 97.28 Examination administration.**

(a) Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice Class operator license) shall be administered by three accredited volunteer examiners. The examiners must hold Amateur Extra Class operator licenses, unless: (1) They are administering telegraphy element 1(A), in which case they may hold Amateur Extra Class, advanced Class or General Class radio operator licenses, or (2) they are administering written examination elements 2 or 3, in which case they may

hold Amateur Extra Class or Advanced Class radio operator licenses.

(b) Unless otherwise prescribed by the Commission, each examination for the Novice Class operator license shall be administered by one volunteer examiner. The examiner does not have to be accredited. The volunteer examiner must hold a current General, Advanced or Amateur Extra Class operator license issued by the Commission.

(c) Upon completion of an examination element, the examiner(s) shall immediately grade the test papers.

(d) When the candidate does not score a passing grade on an examination element, the examiner(s) shall so inform the candidate by providing the percentage of questions answered correctly, and by returning the application (see § 97.26) to the candidate. For examinations other than Novice Class examinations, the test papers, including answer sheets, shall be returned to the VEC that issued them. For Novice Class examinations, the test papers, including answer sheets, must be retained as part of the volunteer examiner's station records for one year from the date the examination is administered.

(e) When the candidate scores a passing grade on an examination element, the examiners (except for examinations for the Novice Class operator license) must issue a certificate of successful completion of the examination. This certificate must bear the VEC-issued examination identifier code (see § 97.523). This certificate is required for already-licensed applicants operating with privileges of an amateur operator class higher than that of their permanent amateur operator license (See §§ 1.925(e) and 97.84). Within one year this certificate may also be used for examination credit for elements 1(A), 1(B) or 1(C) (See § 97.25).

(f) When the candidate scores a passing grade on all examination elements required for the operator license class sought (see § 97.23), the examiners shall certify to the following information on the candidate's application form (see § 97.26):

(1) Examiners' names, addresses and amateur radio station call signs;

(2) Examiners' qualifications to administer the examination (see § 97.31); *and*

(3) Examiners' signed statements that the applicant has passed the required examination elements.

(g) Within ten days of the administration of a successful examination for the Novice Class operator license, the examiner shall submit the candidate's application to: Federal Communications Commission, Gettysburg, Pennsylvania 17325.

(h) Within ten days of the administration of a successful examination for the Technician, General, Advanced or Amateur Extra Class operator license, the examiners shall submit the successful candidates' applications and all test papers to the VEC that originally issued that test.

(i) The FCC reserves the right, without qualification, to:

(1) administer examinations itself; *or*

(2) readminister examinations itself or under the supervision of an examiner designated by the FCC, to any person who obtained an operator license through the volunteer examination process.

14. A new § 97.29 is added to read:

**§ 97.29 Examination grading.**

(a) Each examination element shall be graded separately by the examiners.

(b) An applicant passes a written examination if he/she answers at least 74 percent of the questions correctly.

(c) An applicant passes a code element examination if he/she proves his/her ability to transmit correctly by hand key (straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed for one continuous minute during a five-minute test period. Each five characters shall be counted as one word. Each punctuation mark and numeral shall be counted as two characters.

15. Section 97.31 is revised to read:

**§ 97.31 Volunteer examiner requirements.**

(a) Each volunteer examiner administering an examination for an amateur radio operator license must:

(1) Be at least 18 years of age; *and*

(2) Not be related to the candidate.

(b) Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner for purposes of administering an amateur radio operator examination. However, an employee who can demonstrate that he/she does not normally communicate with that part of an entity engaged in such manufacture or publishing is eligible to be a volunteer examiner.

(c) Each volunteer examiner shall be uncompensated for his/her services.

(d) Each volunteer administering an examination for the Technician, General, Advanced or Amateur Extra Class operator license must be accredited by the Volunteer-Examiner Coordinator (see Subpart I).

(e) The FCC will not accept the services of any person seeking to be a volunteer examiner if that person's amateur radio station license or amateur radio station operator's license has ever been revoked or suspended.

16. Section 97.33 is revised to read:

**§ 97.33 Volunteer examiner conduct.**

A volunteer examiner who has given or certified examinations fraudulently or for monetary or other consideration is subject to revocation of his/her amateur radio station license and suspension of his/her amateur radio operator license.

17. A new § 97.35 is added to read:

**§ 97.35 Temporary operating authority.**

Upon successful completion of an Amateur Radio Service operator examination, an applicant already licensed in the Amateur Radio Service may operate his/her amateur radio station pending issuance of his/her permanent amateur station and operator licenses by the Commission for a period of 90 days or until issuance of the permanent operator and station licenses, whichever comes first, consistent with the rights and privileges of the higher operating class for which the applicant has passed the appropriate examination(s), provided that the applicant retains the certificate(s) issued by the examiners for successful completion of the examination(s) at the station location, and provided that the applicant uses an identifier code provided by a VEC as a suffix to his/her present call sign.

18. Paragraph (f) of § 97.84 is revised to read:

**§ 97.84 Station identification.**

* * * * *

(f) When operating under the temporary operating authority permitted by § 1.925(e) with privileges which exceed the privileges of the licensee's permanent operator license, the station must be identified in the following manner:

(1) On radiotelephony, by the transmission of the station call sign, followed by the word "temporary," followed by the identifier code(s) shown on the certificate(s) for successful completion of an amateur radio operator examination.

(2) On radiotelegraphy, by the transmission of the station call sign, followed by the fraction bar DN, followed by the identifier code(s) shown on the certificate(s) for successful completion of an amateur radio operator examination.

* * * * *

19. A new Subpart I is added to Part 97 to read as follows:

* * * * *

## Subpart I—Volunteer-Examiner Coordinators

### General

**§ 97.501 Purpose.**

The rules in this subpart are designed to provide for the establishment of volunteer-examiner coordinators to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

**§ 97.503 Definitions.**

For the purpose of this subpart, the following definitions are applicable:

(a) *Volunteer-examiner coordinator* (VEC). An entity which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

(b) *Volunteer examiner.* An amateur radio operator who prepares or administers examinations to applicants for amateur radio operator licenses (see § 97.30).

**§ 97.505 Applicability of rules.**

These rules apply to each entity that serves as a volunteer examiner coordinator.

**§ 97.507 VEC Qualifications.**

In order to be a VEC, an organization must:

(a) Be organized at least partially for the purpose of furthering amateur radio;

(b) Be at least regional in scope, serving one or more of the following regions:

(1) Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont;

(2) New Jersey and New York;

(3) Delaware, the District of Columbia, Maryland and Pennsylvania;

(4) Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee and Virginia;

(5) Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma and Texas;

(6) California;

(7) Arizona, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming;

(8) Michigan, Ohio and West Virginia;

(9) Illinois, Indiana and Wisconsin;

(10) Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota;

(11) Alaska;

(12) Caribbean Insular areas: Commonwealth of Puerto Rico, United States Virgin Islands (50 islets and cays) and Navassa Island; and

(13) Pacific Insular areas: Hawaii, American Samoa (seven islands), Baker Island, Commonwealth of Northern Mariana Islands, Guam Island, Howland Island, Jarvis Island, Johnston Island (Islets East, Johnston, North and Sand), Kingman Reef, Midway Island (Islets Eastern and Sand), Palmyra Island (more than 50 islets) and Wake Island (Islets Peale, Wake and Wilkes).

(c) Be capable of acting as a VEC in one or more of the regions listed in paragraph (b);

(d) Agree to coordinate all amateur radio operator examination elements for all amateur radio operator license classes;

(e) Agree not to accept any compensation from any source for its services as a VEC; *and*

(f) Agree to assure that for any examination every candidate qualified under these rules is registered without regard to race, sex, religion, national origin or membership (or lack thereof) in any amateur radio organization.

**§ 97.509 Conflicts of interest.**

An entity engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur radio station operator licenses may be a VEC only upon a persuasive showing to the Commission that preventive measures have been taken to preclude any possible conflict of interest.

### Volunteer-Examiner Coordinator Functions

**§ 97.511 Agreement required.**

No entity may serve as a VEC until that entity has entered into a written agreement with the Federal Communications Commission to do so. The VEC must abide by the terms of that agreement.

**§ 97.513 Scheduling of examinations.**

A VEC will coordinate the dates and times for scheduling examinations (see § 97.26) throughout the areas where communications are regulated by the Federal Communications Commission. A VEC may also coordinate the scheduling of testing opportunities at other places. A VEC shall notify the Engineer-in-Charge of the Field Operations Bureau (FOB) District Office having jurisdiction over the area where an examination is to be held of the time, place and registration requirements for any examination. If no FOB District Office has jurisdiction over the area where an examination is to be held, a VEC shall notify the Chief of the Public Service Division of FOB in Washington, D.C., instead. In either case, this notification must be made at least 30 days in advance of the registration deadline.

**§ 97.515 Coordinating volunteer examiners.**

A VEC will accredit amateur radio operators, licensed by the Federal Communications Commission, as volunteer examiners (see § 97.30). A VEC will seek to recruit a broad representation of amateur radio operators to be volunteer examiners. A VEC may not discriminate in accrediting volunteer examiners on the basis of race, sex, religion or national origin. A VEC may not refuse to accredit a volunteer on the basis of membership (or lack thereof) in an amateur radio organization. A VEC must not accredit an amateur radio operator volunteering to be an examiner if:

(a) The volunteer examiner does not meet minimum statutory qualifications or minimum qualifications as prescribed by the rules;

(b) The FCC refuses to accept the voluntary and uncompensated services of the volunteer examiner;

(c) The VEC determines that the volunteer is not competent to perform the function for which he/she volunteered; *or*

(d) The VEC determines that questions of the volunteer's integrity or honesty could compromise the examination(s).

**§ 97.517 Written examinations.**

A VEC will assemble, print and distribute written examinations designed by the FCC (see § 97.27(d)).

**§ 97.519 Examination procedures.**

At the completion of each examination, a VEC will collect the candidates' application forms, answer sheets and test results from the volunteer examiners (see § 97.28(h)). A VEC will:

(a) Make a record of the date and place of the test; the names of the

volunteer examiners and their qualifications; the names of the candidates; the test results; and, related information.

(b) Screen the application for completeness and authenticity.

(c) Forward the application within ten days of the date of the most recent examination to: Federal Communications Commission, Licensing Division, Private Radio Bureau, Gettysburg, Pennsylvania 17325.

(d) Make available to any authorized FCC representative any requested examination records.

**§ 97.521 Evaluation of questions.**

A VEC will be expected to evaluate the clarity and accuracy of examination questions on the basis of experience, and to bring ambiguous or inaccurate questions to the attention of the Commission, with a recommendation on whether to revise the question or to delete the question from the Commission's list of examination questions.

**§ 97.523 Identification of applicants passing examinations.**

A VEC must establish a unique identifier code for each testing session. This code must be a slant (/) followed by two letters from one of the following letter groups: WA through WZ, KA through KZ, NA through NZ, or AA through AL. The identifier code must be shown on the certificate for successful completion of an examination. The identifier code(s) applicable must be appended as a suffix to the licensee's call sign when the licensee operates under temporary authority granted to amateur radio operators who have passed the appropriate examination(s) for a higher class (see §§ 1.925(e) and 97.84(f)).

**Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service; Correction.**

**AGENCY:** Federal Communication Commission.

**ACTION:** Final rule; correction

**SUMMARY:** This document corrects an FCC Rule regarding Volunteer-Examiner Coordinators (VEC's) in the Amateur Radio Service. This correction is necessary in order to clarify that VEC's will not be required to coordinate amateur radio operator examinations for the Novice Class.

**FOR FURTHER INFORMATION CONTACT:** John J. Borkowski, Private Radio Bureau, Washington, D.C. 20554 (202) 632–4964.

**Erratum**

In the matter of amendment of parts 0, 1 and 97 of the commission's rules to allow the use of volunteers to prepare and administer operator examinations in the Amateur Radio Service; PR Docket No. 83–27, Rm–4229.

Released: October 12, 1983.

1. On September 29, 1983, the Commission released a *Report and Order*, FCC 83–433, in the above captioned proceeding. In the *Report and Order*, the Commission amended Parts 0, 1 and 97 of its Rules to allow the use of volunteers to prepare and administer operator examinations in the Amateur Radio Service.

2. At paragraph 9 of the *Report and Order*, the Commission indicated that it was adopting new rules to apply above the Novice Class, while retaining rules recently adopted in another proceeding for the Novice Class. *See Report and Order*, PR Docket No. 82–727, 48 FR 32586 (July 18, 1983). However, paragraph (d) of newly added Section 97.507 of the Rules in the Appendix would appear to require Volunteer-Examiner Coordinators (VEC's) to coordinate examinations for all classes, including the Novice Class. This was not intended.

3. Accordingly, paragraph (d) of Section 97.507 of the Rules in the Appendix is corrected to read as follows:

**§ 97.507 VEC Qualifications.**

* * * * *

(d) Agree to coordinate all amateur radio operator examination elements for all amateur radio operator license classes except Novice Class;

* * * * *

Federal Communications Commission.
**William J. Tricarico,**
*Secretary.*

**Amendment of the Rules To Authorize Ten Year License Terms in the Amateur Radio Service**

**AGENCY:** Federal Communications Commission.

**ACTION:** Final rule.

**SUMMARY:** The Commission is amending Part 97 of its Rules to authorize ten year operator and station license terms and two year grace period for renewal of expired operator and station licenses in the Amateur Radio Service. The Communications Amendment Act of 1982 authorized license terms not to exceed ten years in the Amateur Radio Service. This change is necessary in order to eliminate a burden on Commission resources and a paperwork burden upon the public.

**DATES:** Effective December 15, 1983.

**PART 97—[AMENDED]**

1. Section 97.13(d) is revised to read as follows:

**§ 97.13 Renewal or modification of operator license.**

* * * * *

(d) If a license is allowed to expire, application for renewal may be made during a grace period of two years after the expiration date. During this grace period, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's expired license or a photocopy thereof.

2. Section 97.47(b) is revised to read as follows:

**§ 97.47 Renewal and/or modification of amateur station license.**

* * * * *

(b) If a license is allowed to expire, application for renewal may be made during a grace period of two years after the expiration date. During this grace period, an expired license is not valid. A license renewal during the grace period will be dated currently and will not be backdated to the date of its expiration. An application for an individual station license shall be submitted on FCC Form 610. An application for an amateur club or military recreation station license shall be submitted on FCC Form 610–B. In every case the application shall be accompanied by the applicant's expired license or a photocopy thereof.

3. Section 97.59 (a) and (b) are revised to read as follows:

**§ 97.59 License term.**

(a) Amateur operator licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license.

(b) Amateur station licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license. All amateur station licenses, regardless of when issued, will expire on the same date as the licensee's amateur operator license.

# AWARDS

*Bill Gosney KE7C*
*Micro-80, Inc.*
*2665 North Busby Road*
*Oak Harbor WA 98277*

## DX AWARDS FROM CZECHOSLOVAKIA

If you've never seen the beautiful DX awards available to licensed amateurs from the Central Radio Club of Czechoslovakia, then you're in for a real treat. It has been my pleasure this past month to have received the full details of their entire awards program and they are described in the paragraphs to follow.

**S6S Award**

The S6S Award is afforded those amateurs who have had a QSO since January 1, 1950, with at least one station located in each of the six continents as defined by the IARU. Awards will recognize those contacts on CW, phone, and RTTY, either allband or single-band achievements. Mixed-mode contacts are recognized.

**P75P Award**

This award is for having worked at least 75 ITU zones as defined by the ITU Geneva Conference of 1959. All contacts must have been made since January 1, 1960, and awards are available in three levels of achievement: 1st class—70 zones, 2nd class—60 zones, and 3rd class—50 zones. Zones may be determined in accordance with a special map made available by the Central Radio Club for a cost of 3 IRCs. Also, it is important to note that all contacts must be made with fixed stations only.

**ZMT Award**

To qualify for the ZMT Award, applicants must have confirmed contact since April 26, 1949, with at least one station located in each of the following 39 areas: OK1, OK2, OK3, HA, LZ, UA1, UA2, UA3, UA4, UA6, UA9, UA0, UB, UC, UD, UF, UG, UH, UI, UJ, UL, UM, UN, UO, UP, UQ, UR, DM (3 different regions determined by the last letter of the callsign), SP (3 different districts), YO (3 different districts), YU (3 different districts).

**ZMT 24 Award**

For those interested in pursuing the ultimate in DX endurance, the ZMT 24 Award is just for you. The requirements are exactly the same as for the basic ZMT Award detailed above, with the exception that all contacts must be made within a 24-hour period. Sound impossible? Absolutely not, but don't be discouraged if it takes you several attempts using the stopwatch!

**100 OK Award**

Check your QSL cards. If you can find a total of 100 OK stations, then you will qualify for the 100 OK Award. All contacts, however, must have been made on or after January 1, 1954. Endorsement stickers are available for every additional 100 stations confirmed, up to a total of 500. Stations may be worked any band, any mode.

**OK SSB Award**

This award requires the applicant to have two-way SSB contact with different Czechoslovak stations totaling 25 points, without a date limitation. 1 point will be scored for each QSO on the 28-, 21-, or 14-MHz bands and 2 points for each QSO on the 7- or 3.5-MHz bands. There are no mode restrictions.

As an added tip to those wishing to pursue these very respectable awards, this editor recommends that you keep a close eye on the "Contests" column in *73* magazine and consider making a few contacts during the annual OK DX Contest. Dates and times will be announced at least a month in advance of the scheduled event. The Awards Manager of the CRC also mentions that QSOs made during the contest will not require QSL confirmations. There is one stipulation, however: Application must be submitted along with your logbook entry for the OK DX Contest.

All the certificates are issued free of charge for members of clubs or associations which accept this rule reciprocally. The fee for all others is 10 IRCs for the P75P Award and 5 IRCs for all the other awards offered by the Central Radio Club of Czechoslovakia. General certification rules apply by which contacts may be verified by two amateurs of a local club, a club official, or a notary public.

Applications shall include details for each contact, i.e., callsign, GMT, date, frequency, mode, RS(T), and any additional information required for the award. Send to Central Radio Club, Awards Manager, PO Box 69, 113-27 Praha 1, Czechoslovakia.

**Slovensko Award**

The DX Club of Radio Amateurs of Slovakia offers this award to all licensed amateurs who can show proof of contact with stations in the different districts (OKR) of Slovakia (OK3, OL8, OL9, OL0; districts listed below) after January 1, 1946.

Stations in countries which have a common border with Slovakia must contact 35 districts, 20 districts are required of stations in other European countries, and 10 districts are required for stations outside the European continent.

There are no band or mode restrictions. Applications with a GCR list and award fee of 5 IRCs may be sent to: Central Radio Club, PO Box 69, 113-27 Praha 1, Czechoslovakia.

Districts which qualify are: Banska, Dystrica, Bardejov, Bratislava, Bratislava-Vidiek, Cadca, Dolny Kubin, Dunajska Streda, Galanta, Hmenne,

Komarno, Kosice, Kosice-Vidiek, Levice, Liptovsky, Mikulas, Lucenec, Martin, Michalovce, Nitra, Nove, Zamky, Poprad, Povazska Bystrica, Presov, Prievidza, Rimavska Sobota, Roznava, Senica, Spisska Nova Ves, Stara Lubovna, Svidnik, Topolcany, Trebisov, Trencin, Trnava, Velky Krtis, Vranov, Zvolen, Ziar nad Hronom, and Zilina.

## TEN-TEN INTERNATIONAL NET AWARDS

For those of us who frequent the ten-meter band, a minute doesn't elapse that you don't hear reference being made to the Ten-Ten International fraternity.

The 10-10 organization was formed in 1962 by a group of amateurs in southern California. To this date, better than 27,000 amateurs have joined their ranks. The unique awards program for this international group was founded and managed for years by Frank Orcutt W4JO, who is now a silent key.

To qualify for membership in Ten-Ten International and to move up on their awards ladder of achievement, you first must make contact with ten individual Ten-Ten members on the ten-meter band. From each QSO, you must obtain the station's call, 10-10 number, name, and exact QTH. Once this has been achieved, you may submit your list along with your check for US$4.00 (includes fee for the quarterly 10-10 publication) to one of the following area or district vice presidents: Earle W1NC, Larry WA2SUH, Jim WA3RBQ, Clint K4EKX, Grace K5MRU, Dick W6ANK, Ron WB7ADO, Del W9BPU, John NØADJ, Mac ZL3RK (New Zealand), Art VK2BXN (Australia), August DK5UG (Europe), Jim K6PJO (DX at large).

Your application is checked against the 10-10 net roster, and if found correct, you will be issued your very own 10-10 number and Black Cat Certificate.

Once you obtain your 10-10 number, you may begin work toward various "bar" awards. The bar awards are issued in multiples of 100 individual 10-10 contacts. To apply for any bar award, you must not duplicate contacts previously claimed. In each case, submit only 100 contacts per application—no more. Each must show the callsign of the station worked, the 10-10 number, name, and exact QTH.

Award applications must show contacts in 10-10 number sequence. Applications received in any other order will be returned. There is no award fee for "bars"; however, an SASE sent along with your application is appreciated. Send to: Bill Risher WB6OMH, 10542 Lock Avon Drive, Whittier CA 90606.

This same process is repeated for the 200, 300, and 400 bar awards. Where it will end, nobody knows, for the most numbers collected to date is by Grace K5MRU, who now has 8200 confirmed.

When you reach the 500 bar, serial numbers are then assigned to each bar issued thereafter. Once the applicant reaches 1000, he or she reaches the first step in which award plaques are issued. Plaques are issued also for 2500, 5000, and 7500 contacts.

### 10-10 WAS Award

This award requires an applicant to make at least one contact in each state with another member of Ten-Ten International. QSL cards and sufficient postage for their safe return are to be sent with your application to WB6OMH. This award is issued only for contacts made after January 1, 1973, on any authorized mode on the ten-meter band.

### The VP Certificate

To qualify for this award, a net member must have earned his or her "500 bar," at which time a VP number and certificate were assigned. The idea for the VP certificate issued here is to work at least 100 other net members who have achieved their 500 bar and who have been issued a VP serial number. To be valid, all contacts must be made between 28.500 and 28.550 MHz or above 29 MHz, with the contact lasting at least 5 minutes. As with all 10-10 awards, application must indicate the 10-10 number, callsign, name, frequency, and exact QTH. Also, a definite requirement is to list the station's VP serial number.

All contacts must be made on or after October 15, 1979, to qualify. Send your application to: Grace Dunlap K5MRU, Box 445, La Feria TX 78559.

To the best of our knowledge there is no award fee.

### Lucky 13 Award

The Lucky 13 Award is to prove that your station is capable of working the entire 10-meter band. This is not a frequency-measuring test and it is not necessary to stay exactly on the prescribed frequencies. The idea here is to make contact with 13 different VP members on each 100-kHz segment of the band: 28.500, 28.600, 28.700, 28.800, 28.900, 29.000, 29.100, 29.200, 29.300, 29.400, 29.500, 29.600, and 29.690 (29.700 is the band edge, so be careful). Any mode or mixed mode is permissible. As with all awards, you must log the callsign, the VP number, the first name, the QTH, and in this case, the date and time of each contact claimed. It is not necessary to send QSLs, but you should have your list verified and mailed to: Rich Richardson QBØFQD, 960 E. Cottonwood Avenue, Littleton CO 80121.

## FEARL AWARDS

I received award information from a personal friend of mine, Glenn KA8GW (WB7SPD), who used to reside here on Whidbey Island and is stationed with the US Navy in Masawa, Japan. Glenn urges those seeking the awards being offered by the Far East Auxiliary Radio League (FEARL) to be careful to only count contacts with KA stations in Japan and not to include those in the continental United States.

Glenn mentioned a couple of nets which may assist those wishing to meet the award requirements in a minimum of time. 14.284 MHz is the golden frequency on Sundays at 0200Z and Wednesdays at 1200Z.

All FEARL awards are available for $1.00 or 7 IRCs, which must be sent with your application to: Far East Auxiliary Radio League, Attention: Awards Manager, c/o Sam Fleming KA2SF, GARH-ID-GS-M NCS Japan, APO San Francisco CA 96343.

### Worked Fifteen KA Stations

To qualify for the WFTKAS Award, applicants must work a minimum of at least 15 KA stations located in Japan or Okinawa. Stateside KA stations do not count. There are no mode or band restrictions nor are there any date limitations. General certification rules apply, with proper logbook data.

### KA Rag-Chewers Club

This award certifies that the applicant has presented evidence of having had a rag chew with a KA station in the Orient for a period of not less than thirty minutes. There are no band, mode, or date limitations. To apply, merely give general logbook data including the time your QSO began and ended. GCR apply.

### Rag-Chewer Supreme

Should you be longwinded and were fortunate enough to enjoy an hour-long QSO with a KA station in the Orient, then the Rag-Chewer Supreme award is designed especially for you. To apply, merely provide logbook data and the appropriate award fee of $1.00 or 7 IRCs. GCR apply.

### KA Roundtable Award

To qualify for this award, the applicant must establish and maintain two-way amateur-radio communication with at least two KA stations in the Orient on the same frequency at the same time for a minimum of thirty minutes. There are no special band or mode endorsements. Date is not a factor. GCR apply.

### Shortwave Listener Award

For the shortwave listeners, FEARL presents this award for having heard and rendered a signal report to the operators of at least two KA stations in the Orient. Applicants merely send general logbook data and the appropriate award fee when applying.

## UTICA NY

The Utica Amateur Radio Club will operate special-event station K2IQ, commemorating its 50th anniversary, from 1700Z February 11 to 2200Z February 12, on SSB, 25 kHz from the upper edge of the 40-, 20-, and 15-meter bands, and 25 kHz from the upper edge of the 40-meter Novice band. QSL with SASE and contact number for an attractive certificate to: K2IQ, PO Box 71, Utica NY 13503.

## SNOWFLAKE MADNESS

The Michigan Technological University Amateur Radio Club and the Copper Country Radio Amateur Association announce a radio celebration of their Winter Carnival festivities in the northernmost part of Michigan's upper peninsula.

Tech's Winter Carnival is probably the most spectacular winter festival in America with snow sculptures, ice hockey, dogsled racing, skiing, and other festive events.

In association with the Copper Country Chamber of Commerce, we are issuing a certificate to all amateurs who make contact with any participating ham in the Copper Country between 0000 February 2 and 0000 February 8, 1984.

Only one contact is required to get a certificate. Frequencies are 3.630, 7.090, and 14.095, RTTY; 3.705, 7.085, 14.085, 21.085, and 28.185, CW; and 3.930, 7.285, 14.305, 21.385, and 28.685, phone. On CW listen for CQ Winter Carnival.

Send your QSL along with three 20¢ stamps (for postage and handling) to: Howard Junkin N8FHF, 106 W. South Avenue, Houghton MI 49931.

## HOSARC SPECIAL-EVENT STATIONS

The Hall of Science Amateur Radio Club will issue a commemorative certificate to anyone working a HOSARC club station on January 15 from 1400 to 2300 UTC, in conjunction with HOSARC's 11th anniversary. Stations using the call WB2JSM will operate CW in the first 25 kHz of the Novice bands of 40, 15, and 10 meters. Stations using the call WB2ZZO will operate SSB in the first 25 kHz of the General phone bands of 40, 20, 15, and 10 meters. QSL with a large SASE (40¢ or 1 IRC) to HOSARC, PO Box 131, Jamaica NY 11415, or to WB2YXB, club QSL manager.

## PUNXSUTAWNEY PA

The Punxsutawney, Pennsylvania, Amateur Radio Club will commemorate Groundhog Day on Sunday, January 29, 1984, from 10 am to 5 pm on 7.230 and 14.290. For a certificate send an SASE to Clif WB3GAD, RD #6 Box 211, Punxsutawney PA 15767.

# DX

*Chod Harris VP2ML*
*Box 4881*
*Santa Rosa CA 95402*

## HAPPY NEW YEAR

The start of a new year brings reflection and anticipation: reflection on the events of the past twelve months and anticipation for the coming year. It is a time to think back on coveted successes and missed opportunities, a time to consider what you will be doing over the next year.

1983 was a good year for DX. Not a great one; the sunspot numbers continued to fall, shortening band openings and weakening signals. But 1983 also saw some excellent DX from many corners of the globe.

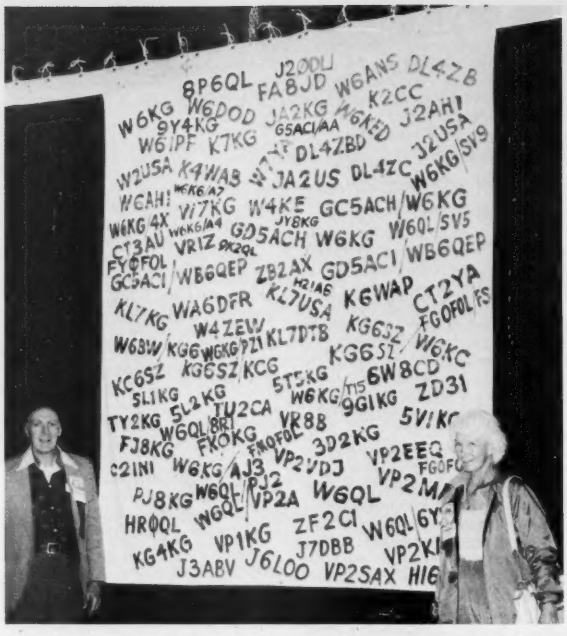
Among the DX highlights were not one but *two* DXpeditions to inhospitable Heard Island, the disaster in the Spratly Islands, a highly successful assault on Malpelo, increasing activity from China, and dozens of other amateur operations.

What do we see ahead for 1984? Radio propagation will continue to decline. The sunspot numbers are already well below their peak levels of the late '70s and early '80s, and they will fall still further this year. This regular pattern of worsening propagation is familiar to DXers of more than 10 years standing. The old-timers will remember the slow days of the mid-'70s when sporadic E and trans-equatorial propagation provided what little DX excitement there was, and DXing hours were spent fighting the static on the lower frequencies and calling long CQs on apparently dead bands.

1984 probably will not be the bottom of the current sunspot cycle. The 1986-8 period is a more likely candidate for that dubious honor. However, the sun can be fickle, and it can decrease activity dramatically or flare up and provide some good DXing. But the overall trend in 1984 will be down.

Those DXers bitten by the DX bug in the past few years, however, will be hard pressed. The tremendous increase in the number of amateurs worldwide and especially the number of DXers, since the last sunspot minimum, is unprecedented. Many thousands of amateurs turned on to DX at a time when 10 Watts into a wet noodle could be heard around the world. The amateur radio equipment of today is significantly advanced over that of ten years ago, facilitating such communications.

*Jim Smith VK9NS plans a 1984 DXpedition to Kermadec Island, north of New Zealand. Jim led the Heard Island DX Association trip to Heard last year. (Photo via* The DXers Magazine*)*




*Lloyd W6KG and Iris W6QL Colvin swing through South America on the 1983-4 Yasme trip. (Photo via* The DXers Magazine*)*

The effects of these factors of declining sunspots and large numbers of avid DXers can be seen already. When a DX station comes on the band, a pileup often begins even if the station is not particularly rare. The large number of DXer mice chasing the increasingly elusive DX cheese makes it very difficult for foreign stations to have satisfying contacts. This trend will only worsen.

For the many thousands of amateurs who have started chasing DX since 1978, 1984 will be a year of decision. Should I upgrade my station to remain competitive in the increasingly-difficult DX world? Should I try to tough it out with my present equipment, meekly accepting diminishing results? Or should I forget about DX for a few years and turn to satellite operation or stamp collecting?

The hard-core DXer will rise to the challenge, improving his station and operating techniques to ensure DX success. And the DXer will have considerable assistance in this task. Again in 1984, as in the past years, a number of hard-working and dedicated amateurs will be traveling to choice DX locations around the world to hand out contacts to the "Deserving DXers."

## THE DX ADVENTURE

Some of the most rewarding aspects of DXing are the wonderful people who devote so much of their own time and money to sponsor, organize, and operate on DXpeditions to the rarer amateur spots in the world. Without the dedication and persistence of these amateurs, the DX world would be dull indeed. And a fine example of this respected breed is Jack Binder KB7NW.

An avid traveler, Jack had moved to Australia in 1969 with his English wife, Jude. A few years later, the Binder family, including two young sons, set sail in their home-built *Banyandah* (which is Aboriginal for "Home on the Water"). And that's what the yacht was to the family of four: their only home. For eight years the family cruised the Pacific, covering more than 60,000 miles. Jack and Jude took turns teaching their boys using materials from a cooperative stateside school. The parents supplemented the traditional curriculum with extra lessons in marine biology, botany, and geography, based on their travels.

The Binders kept their expenses to the minimum (there was no need of clothes on the boat or uninhabited islands, for example), but they did need a source of cash for foodstuffs, supplies, and repairs. Sometimes Jack worked on land for a short time, but in 1978 he turned to charter trips for income. And one of his early charters was a DXpedition to Mellish Reef, off Australia.

Jack's next DXpedition would be enough to turn most hams away from this pastime: Jack's yacht was fired upon as it approached Amboyna Cay, in the Spratly Islands, in 1979. The Binders escaped without being hit, unlike the Germans in the more recent attempt. Several members of that DXpedition figured Brunei VS5 was exciting enough, but Jack and two other hams returned to the Spratlys, setting up and operating on Barc Canada Reef. Since then, Jack's wanderlust and DX spirit have led him to Palmyra, Kingman, Tokelau, and back to Mellish Reef.

The Binders called a temporary halt to their odyssey in 1982 and placed their sons in a regular school for the first time in their lives. Meanwhile, Jack earned some much-needed funds by piloting a charter vessel around the Great Barrier Reef. "It's an unalterable fact of life that it costs money to live, no matter how idyllic the life-style or how basic and down-to-earth one lives," Jack explains.

Jack makes it very clear that this land-based existence is not permanent. "My one and only true love will always be *expeditions*. There is something about them that's hard to put down in words. Something about conceiving the idea, then putting it into action, following it through in every tiny detail until the speck of land shows on the horizon and the operators get down to business. It's out and out adventure, but with a purpose."

Now, 1984, the Four Js (Jack, Jude, Jerome, and Jason) are on the open ocean again. The planned itinerary includes the Solomon Islands (H44), the Philippines (DU), Singapore (9V), and the Seychelles (S7) on the way to the western Indian Ocean. The DX targets there are Mayotte (FH), Glorioso (FR), and Juan de Nova (FR), in late spring or early summer.

A host of other DXpeditions are scheduled for early 1984. A group of Venezuelan amateurs intend to land on tiny Aves Island in the Caribbean. Aves (YV0), about 125 miles southwest of Montserrat, is so low to the water that high waves and tides preclude landing for much of the year. Also on tap for the coming year is another trip to Clipperton Island (FO) by a collection of Tahitian and stateside hams. And Jim Smith VK9NS (see photo) of Heard-Island fame is putting together a scientific and amateur operation on Kermadec Island (ZL/K). Closer to home, the Colvins are on the move again, and a couple of Puerto Rican amateurs are shooting for Desecheo (KP4/D)—see details, below.

*Desecheo from the air. Two Puerto Rican amateurs hope to activate KP4/D this month. (WP4ATF photo)*

## *YASME* SAILS AGAIN

Once again, Lloyd and Iris Colvin, W6KG and W6QL (see photo), are DXpeditioning, this year concentrating on South America where contacts may be plentiful but QSLs rare. The Colvins are sailing under the auspices of the Yasme Foundation, the nonprofit group which has been sponsoring DXpeditions for many years. The name, Yasme, comes from the yacht of that name on which Danny Weil sailed for many DXpeditions twenty years ago.

The Colvins customarily set up a substantial station in each country where they operate, including beam antennas and amplifiers. They thus present a consistent signal and are quite easy to work. Also, the Colvins stay at each location for several weeks, working 5-10,000 QSOs, which gives DXers with very modest stations ample opportunity for a contact. And the Yasme Foundation QSL system is excellent.

Look for the Colvins (with portable calls or calls ending in KG or QL) toward the low ends of the bands, especially the lower frequencies. Send QSLs to Yasme Foundation, Box 2025, Castro Valley CA 94546.

## DESECHEO

Two amateurs from Puerto Rico plan a DXpedition to tiny Desecheo Island in the Caribbean this month. Jose Maldonado WP4ATF and Rodolfo HI3RST/KP4 are aiming for the first week in January for

their three-day operation. They will use their own callsigns with the designator /D. They solicit contributions and QSLs via Box 449, Palmer PR 00721.

Desecheo was one of the last DXCC "countries" admitted under the "separate administration" rule which has since been eliminated. The island is a wildlife refuge only a few miles west of Puerto Rico. Its refuge status was the reason for its separate-country designation by the ARRL, but this same status also restricts travel to the island. The Fish and Wildlife people don't want dozens of hams swarming over their island, littering with beer cans and coax cable bits. Consequently, only a few amateur DXpeditions have operated from the island, starting with Bob Dennison W@DX.

The well-run International DX Foundation DXpedition to Descheo two years ago cleaned up most of the demand for KP4/D, but then, the definition of a rare country is "the one you don't have," regardless of how easy it is to work. Hopefully, the operators will spend some time on the lower frequencies to take advantage of the good propagation from that part of the world and to meet the increasing demands for 40-, 80-, and 160-meter DX contacts.

## KEEPING INFORMED

There is a major difference between working a DXpedition versus contacting a resident of the country. In the latter case, the timing probably is not very important. If you don't work him this time, you might tomorrow, or next week, or next year. But you don't get a second chance with many DXpeditions. How long do you think it will be before hams return to Heard Island?

DXpeditions give DXers a great shot at the DX contact, and in many cases provide the *only* way for radio contacts. After all, many of these DXCC "countries" are totally uninhabited. Many are uninhabitable over the long term, and only the limited stay of a DXpedition provides DXers with a shot at them.

So the DXpedition will *not* be there next week, or next year. It may be years before that particular "country" again attracts a DXpedition. Thus the DXer cannot afford to miss the contacts offered by the DXpeditioners. If you hibernated through the Heard Island activity last year, you probably won't get another shot at it for many years.

Real DXers understand that keeping informed on a timely basis is an essential part of successful DXing, especially as the sunspots decline and the pileups increase on the few remaining DX stations.

The chief way of keeping abreast of the DX world is through the radio; active amateurs who talk to and listen to their fellow DXers will know who is on now, who is supposed to be coming on, and where. There is no substitute for activity. But there are aids which make DXing more effective and enjoyable.

You local radio club can be an excellent source of DX information. Keeping in touch with other DXers in your area is like having extra pairs of ears. You can be keeping an eye on 20 meters while a fellow DXer across town is watching 40. A quick call over VHF FM keeps both hams informed.

Many areas of the country have taken this a step further by organizing DX clubs. The larger DX clubs sponsor repeaters dedicated to DX and DXers. Now with dozens of ears out, little DX slips by. A DX station can tell when his presence is broadcast over a DX repeater easily. He first works one station in an area, say San Francisco. Then, a couple of minutes later, another DXer from the same region calls. Then stations from all over the Bay area are in the pileup!

Of course, the flow of information must go both ways. The DXer should share his success with the other members of the club and not simply take advantage of the hard work of others. And the DX club probably has many other tasks which need help: meetings, newsletters, repeater maintenance, etc. So one way you can continue your DX success is to join and support your local radio club.

Other useful sources of DX information are the DX bulletins. DX columns in the major amateur radio magazines (such as this one) have lead times too long for the kind of timely information needed in the DX world. You need to know what is on *now*, and for that a weekly DX news sheet can be well worth the money.

So to help you keep up-to-date in the DX world in 1984, the two major weekly DX bulletins are offering a free subscription to a couple of lucky readers of this column. Send your QSL card (and maybe a photo of you and your shack) to VP2ML, Box 4881, Santa Rosa CA 95402 by January 31, 1984. I'll pull a couple of cards out of my hat and present the lucky winners with a one-year subscription to *The DX Bulletin* or *QRX DX*.

If you can't wait and you aren't lucky enough to have your card pulled out of the hat, you can subscribe directly. Send $28.00 for a one-year subscription to *QRX DX*, Box 4072, Richardson TX 75080, or to *The DX Bulletin*, Box 873, Vernon CT 06066.

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# REVIEW

## THE HEATHKIT SS-9000

From the time about two years ago that I had the opportunity to try out a prototype of the SS-9000, I have looked forward with anticipation to seeing it on the market. While the unit has many features attractive to the SSB operator, it should have special appeal to the computer-oriented operator who likes to jump from band to band and frequency to frequency in search of a good QSO or rare DX. The CW operator can take advantage of two extremely effective narrow filters in addition to the above-mentioned computer capabilities.

A floppy disk that demonstrates some of the capabilities of the unit's controller is shipped with it. The disk utilizes interaction between the computer, the operator, and the SS-9000 during the demonstration. The program that controls the unit during operation is within the unit itself, in the controller circuit, however. As a consequence, only a terminal is required, and any computer used must be reconfigured as a terminal if it is to be used to control the SS-9000. I used a Heathkit H-89 computer to run the demo disk and then had to go into the cabinet to change a jumper cable to use it as a terminal. In effect, I was dedicating the computer to use with the SS-9000 alone. My guess is that anyone who wants to control his unit with a keyboard will opt for some inexpensive terminal rather than restricting the use of his home computer to transceiver control.

### Terminal Functions

The unit is programmed to remember and display both the frequencies last shown on the two frequency displays and the one stored in memory on each band. If I inadvertently bandswitch to one of these bands, the displays (and terminal printout) will return to the appropriate band limit and the stored frequencies will be lost. In order to be used, the frequencies must be retrieved by the terminal.

The terminal also controls and indicates the frequency within each band to which the receiver and transmitter have been toggled. Two push-buttons centered under the middle of the two frequency displays do this switching in the manual mode. The indicators for toggling on the unit are red LEDs for transmit and green LEDs for the receive frequencies. The displayed and remembered frequencies for each band can be established by either terminal or manual control at any time.

Some other functions the terminal can control and indicate are:

- Passband shift in 100-Hz steps—as many as 600 Hz down and 400 Hz up
- Bandswitching
- Scan rate
- Transmit/Receive
- Mode: LSB, USB, CW wide, CW medium (400 Hz), CW narrow (200 Hz), and RTTY (400 Hz)

During operation on any given band, the operator has the ability to preset all of these functions in anticipation of operating on another band.

### Shared Functions: PLL Tuning

The phase-locked-loop tuning is deadly accurate to the 100-Hz steps by which it changes. No supplementary frequency standard is necessary. PLL with 100-Hz resolution introduces a problem in bringing two or more transceivers to the identical frequency. I can be as much as 50 Hz off while attempting to zero beat another signal with the SS-9000. The other station with stepless tuning might have to make up the difference. The SS-9000 CW operator might become a little frustrated with this dependence on the other operator if he is a purist. Fifty- or ten-Hertz resolution would lessen the problem of frequency matching, but for most operators the higher resolution is probably unnecessary.

### Scan Rate

PLL tuning makes it practicable for the manufacturer to offer tuning up or down the band at almost any desired rate. This rate can be determined for the SS-9000 by the setting of four DIP switches. Since access is gained to these switches by removing the cover of the unit (nine screws), I probably won't change them often. On the other hand, if I'm operating with the terminal, I need only to punch S = 1 (to 16) to vary the manual scan rate through its whole range.

*Photo A. The Heathkit SS-9000.*

### Memories

The practicality of the memories comes out when I'm looking for a QSO on whatever band is open. I'll flip the rig on to hear immediately a sector of a band that I have last used. Nothing new there, but I have also two other segments of the band that I can check out with two punches of a button. This happens without my losing the first frequency in the process. I can tune up or down from any of the three spots if I hear nothing interesting. If I hear a station in QSO that I might like to talk with when he finishes, I commit his frequency to memory—not my memory but the memory of the SS-9000—and resume searching for a CQ or someone finishing a QSO. If I don't find either, I can check back on the QSO with a punch of a button, and if it's still underway, resume searching with another punch.

If somehow I hear a second hot prospect for a later QSO, I can leave the one display on that second station and toggle the receiver over to the other display to continue searching. Then if I want to take a quick listen for activity on the other band, the three selections are preserved in memory.

### Bandswitching

On the SS-9000, changing bands with the front-panel bandswitch can be made to activate an antenna switch for each selection. There is a plug on the back that will connect the unit directly to the Heathkit antenna switching relay. This function can, of course, be adapted to other antenna switches.

Bandswitching by computer or terminal control is another capability of this unit. A motor switches bands as well as antennas if this is desired.

On this unit, the bandswitch hung up at times when I attempted to rotate it counterclockwise manually. This could have damaged the switch if I had strong-armed it. This is because the teeth that engage during computer-controlled bandswitching are not quite separated adequately on this particular motor assembly. I expect that a call or a letter to the company could bring a new assembly in the mail. Since the assembly is located in a housing that

*Photo B. Bottom view of the SS-9000.*

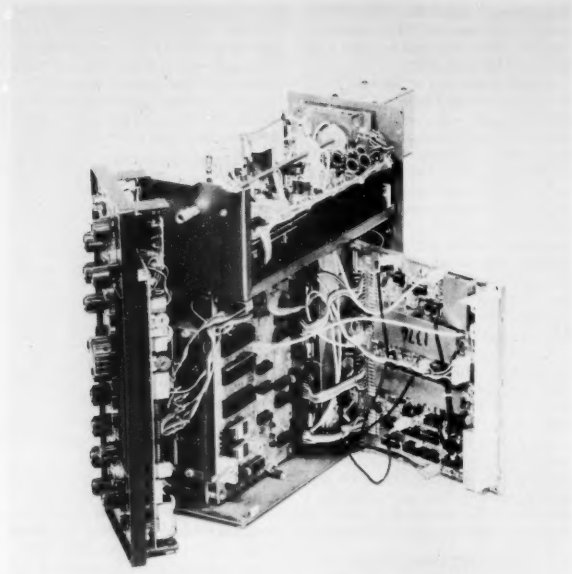

*Photo C. Top view of the SS-9000.*

extends from the back of the unit behind the bandswitch shaft, it would not be difficult for me to replace.

**Receiving**

True to the numbers given in the manual, the bandpass filter and CW filters are extremely effective. The effectiveness of the SSB bandpass filter can be demonstrated easily with a turn of the bandpass shift switch during reception with a strong interfering signal parked close by. All I sacrifice for this filtering are some of the lows of the received operator's voice, or some of the highs. Being able to drop a strong unwanted signal off the side of the bandpass plateau can result in a significant increase in intelligibility of the wanted signal.

**CW Operation**

Using the CW narrow filter, I can drop a strong intefering signal 100 Hz or more away down to a level at which I can copy a desired signal through it. This means, too, that the strong signal is far enough down the filter passband skirt that the agc is not triggered to the point that the weak signal doesn't get amplified adequately. In fact, the filtering is such that I am able to copy CW with the comfort of agc leveling of the desired signal almost without exception since the CW filtering renders harmless the signal-killing effect of the agc from strong stations. Another nice feature of the narrower filters is the lack of ringing I experienced. This is an especial advantage while copying high-speed CW. The SS-9000's filtering is the cleanest I have heard in this regard.

Since I'm not a musician and don't have perfect pitch, I have the same problem with the SS-9000 that I have with any other transceiver. I can't tell by ear when I have the desired signal at the offset frequency of 800 Hz. It's easy to tell by peaking the signal with the S-meter with the narrow CW filter switched in if there is no interference and/or fading. It's almost impossible otherwise to tune the transmitter exactly to the frequency of the received station without an outside reference tone.

Being able to tune as closely as possible to another signal with one's own transmitter is important. It minimizes the amount of band space taken up, it's easier for others to break in, one doesn't have to retune for each signal in a round robin, and it minimizes leap-frogging. I attempt to minimize my contribution to the problem by using a cheap audio frequency standard: a musician's pitch pipe. I tune the note of the desired signal to F-sharp, 800 Hz. Then my signal and at least one other are on the same frequency.

**Transmitter**

Front-panel controls in addition to the shared transceiver controls of band and frequency are: power output, VOX delay, speech compression, and microphone gain. Power output can be read directly from the multi-function meter as the power control is varied. These are all that are needed to control SSB transmissions from contact to contact. Speech compression, if desired, is switched on and turned up until compression indicated on the meter on voice peaks gives the same excursion of the needle as depressing the tune button while the meter is switched to read power. That's probably the most complicated maneuver necessary to learn to be able to take full advantage of the SSB feature of this unit. Microphone gain also is turned up on voice peaks until the meter, switched to ALC indication, shows some ALC action.

VOX delay, compression, and microphone gain may need to be varied from operator to operator, justifying the location of the controls on the front panel. Three other controls will need to be set, but not adjusted as frequently as the front-panel controls. These are: CW sidetone level, anti-trip, and VOX gain. Adjustment of these is made through the right side panel.

**Power Supply**

The companion power supply to the SS-9000 will operate with inputs in the 120- and 240-V-ac ranges to provide 13.8 V dc with sophisticated regulation and protection. It has high-temperature protection from heat, sink sensing, surge-current protection, and short protection. Tripping the last of the three will require resetting the on-off switch. The first two react by reducing power-supply output to safe levels until the condition reverses itself. The power-amplifier transistors of the SS-9000 are provided protection from excess current flow by these power-supply circuits as well as by power-output-controlling circuitry that is heat-sink temperature dependent, and by high vswr cutback circuitry.

The power-supply cabinet contains the speaker for the unit and two clocks, each settable by its own two front-panel buttons. The clocks will operate with either 12- or 24-hour format. The readouts are green vacuum flourescent tubes, as are the frequency displays on the SS-9000.

**Summary**

Setting the SS-9000 up for operation on SSB and CW was as straightforward as could be. I did not make use of the RTTY mode, but RTTY sending and receiving should be optimally simple also. A 400-Hz RTTY filter position is provided in the mode switch as well as the usual LSB.

The several controls that must be dealt with in order to operate SSB are easily set using the owner's manual. Front-panel-control changes, such as power output, VOX delay, compression, and microphone gain are extremely simple with the multi-function metering provided at the touch of a button.

Operating the SS-9000 with an amplifier is easily arranged. After stringing a phono-plugged cable for the relay and the ALC voltage, I just punched the tune button and screwdriver-adjusted the ALC level in the back panel to limit the amplifier current properly by limiting drive power.

I had to get used to operating CW without QSK, coming from a rig that has a carrier-operated relay (COR). It was good discipline for me to attempt to keep my transmissions short. Rumor has it that it was felt the frequency synthesizer loops might be too unstable while using the COR in this unit with high-speed CW. As you can tell from the advertisements, only very recently have manufacturers developed confidence enough in their designs to offer full break-in operation with PLL tuning, Heathkit included.

**Conclusion**

I very much enjoyed indulging in fantasies about how I could take advantage of the unique features of this rig. One idea most appealing was to buy some cheap high-lying property in my local telephone-calling area or within UHF range and set up the SS-9000 right in the middle of a huge antenna farm. A terminal with modem could control the unit, and I could operate from any convenient room in the house.

The capability of terminal control rather than computer and software control appeals to me. I'm eager to develop applications for personal computers in my life, but I'm not enthusiastic about dedicating a PC to a single use. If the feature of terminal control and the concept of a quality-built, sensitive, selective, adaptable transceiver appeal to you, give the SS-9000 serious consideration.

For further information, contact the *Heath Company, Benton Harbor MI 49022.* Reader Service number 484.

**Dave Learned W8DFI**
**Benton Harbor MI**

## WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

## A BOOK ON AMTOR: WHAT, WHY, AND HOW

AMTOR means *AM*ateur *T*eletype *O*ver *R*adio and provides almost error-free

transmission and reception of messages. A form of RTTY that uses a seven-bit (Moore) code, TOR has been in use by both land-based and sea-based stations for several years but has been adopted by amateurs only recently.

The International Telegraphic Union Report CCIR 476-2 (1978) formed the basis for the 1983 FCC approval of AMTOR, and provides a set of operating standards and procedures.

And now, because of the relative newness of AMTOR to the amateur-radio fraternity and because some of the introductory articles that appeared in amateur magazines have been missed by amateurs who may be interested in trying out this new mode of communication, Phil Anderson W0XI has put out a neat, soft-cover publication called *Introduction to and the Operation of AMTOR.*

The table of contents lists a preface and introduction and chapters entitled Why AMTOR, Basic Equipment, Basic Operating Procedures, An Operating Example: AMTORSOFT (Copyright 1983 by Kantronics, Inc.), and Theory of Operation, AMTOR; there also is an appendix which includes chapters on a "Brief History of AMTOR," a table of the AMTOR code, and references.

The author uses cartoons in an early chapter to relate the reader to the idea of AMTOR, showing how interference can be minimized through repetition of the message and how an acknowledgement of message received is an important element of the system.

The booklet describes how essentially error-free comunication can result in spite of fading, interference, and the use of low power by either or both stations in a two-way circuit. It shows the reader what equipment is required, basic operating procedures, where to find and how to tune AMTOR, how to establish contact, how to send and receive messages, and provides dozens of other vital pieces of information that one will want to know when beginning. Retail price of this 37-page booklet is $3.50.

For further information, contact *Kantronics, Inc., 1202 East 23rd Road, Lawrence KS 66044.*

**Jim Gray W1XU**
**73 Staff**

## THE J. C. LABS ACTION MONITOR

The first thing you'll ask yourself—as I did—is, "Why hasn't someone done that before?"

The Action Monitor is one of those devices that is simple, neat, and effective. . . besides which it is *needed*! Let me give you an example.

How many of you have a scanner or monitor that has to be left unattended much of the day (or night)? There may be something that comes over the monitor that you want to know, or even have to know. . . yet you can't be there.

How about a DX station that you have been waiting for on a spot frequency, but you have to go to work and may never know whether it ever showed up?

If you've ever worried about not getting that vital message, or capturing that signal that you wanted, the Action Monitor by J. C. Labs is for you. Here's how it works.

The Action Monitor is actually a VOX unit that operates a built-in switch to turn on a tape recorder or other recording device. You attach the speaker output of your receiver or scanner to the input terminals of the Action Monitor by a pair of wires. These can be audio wire, zip cord, or even a shielded pair, although it isn't necessary to go to shielded wire unless you want to.

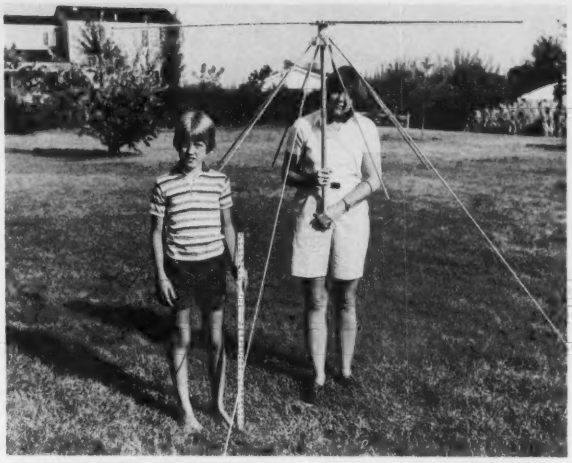

*Photo A. The yardstick held by Alex Torres indicates size of the discone held by Joan Torres.*

Next, you attach one of the output leads of the Action Monitor to the tape recorder's push-to-talk input jack by means of the mating plug already furnished; and finally, you attach the other output lead to the tape recorder's microphone input jack by means of the mating plug also furnished. Now you are ready to record.

There is an ON-OFF switch on the Action Monitor. In the OFF position, the Action Monitor is not functional and your scanner or receiver functions normally—that is, without recording anything. Now comes the good part: You turn the switch to ON and you set the tape recorder to the RECORD position. Then tune in a signal on the receiver and watch what happens. As soon as the signal is received, the Action Monitor automatically turns the tape recorder on, and it records the received signal.

In case you wonder about it turning off too soon and missing a reply, Jim Casamassa of J. C. Labs has that all figured out: He provides a two-second delay in the Action Monitor so that it doesn't shut the recorder off immediately. Thus, if there is another signal following the first one by a short delay it also is picked up. Neat, huh?

Okay, how well does it work, you'd like to know? *It works just great!* My thing, for instance, is monitoring the aircraft bands. I like to listen to the commercial airliners call in to the Boston Air Traffic Control Center, so I merely hook up my aircraft monitor receiver to my tape recorder through the Action Monitor, and let it record while I am away from home.

In case you wonder why I do that, let me say that it's not mere curiosity. I happen to be a pilot who uses radio communications in my aircraft. Aircraft radio procedure is short, terse, clipped, and *fast*. It takes a bit of getting used to, and you have to mentally gear up to understand it . . . particularly when you receive instructions to make a complicated approach. I find that the only way for me to be able to understand these rapid-fire contacts is to practice, practice, and practice listening, and the Action Monitor is the perfect way to do it simply and painlessly. I can get a tape full of information over a period of a day's time, so that when I get home in the evening, I can listen to the tape and hear what has happened while away. Best of all, I can replay the tape again and again to get that important practice.

Your use of the Action Monitor may be somewhat different than mine, of course, but that doesn't mean it will be less useful. A friend of mine listens to those "secret" frequencies where nothing happens for hours—even days—at a time. Then, suddenly, there is a burst of information. The Action Monitor is there, ready as always, to catch and record the transmission. Clandestine-radio monitors will find the Action Monitor to be absolutely necessary for their purposes—it is a valuable tool that saves time and money.

Speaking of which, you ought to know that the Action Monitor costs only $39.95 (plus $2.00 shipping and handling)—an extremely affordable price, in this writer's opinion, for something that is as useful and simple as this device. As I said in the beginning, why hasn't it been done before?

Oh, yes, one more thing: The Action Monitor comes complete with 9-V battery for powering the VOX circuit. While the battery seems to last forever, it is possible to use an ac adapter to furnish the necessary direct current. J. C. Labs furnishes one that is suitable for use with the Action Monitor for $8.95, as an optional accessory, plus a $1.00 shipping and handling charge.

For more information, contact *J. C. Labs, PO Box 183, Wales WI 53183; (414)-547-7987.* Reader Service number 482.

**Jim Gray W1XU**
**73 Staff**

## A NEW DISCONE ANTENNA FOR AMATEUR SERVICE

For the past twenty years, the discone antenna has been a very popular item among military communicators, and until recently, the only source for such antennas was the military surplus business. But things are changing, and in the last few months, TET (Taniguchi-Engineering-Traders, Yokohama, Japan) has introduced a discone antenna for amateur use.

The useful frequency range of the antenna is an impresssive 50 to 480 Megahertz continuous. That's one of the biggest payoffs of a discone: about an octave worth of bandwidth. TET claims that the swr anyplace in the useful frequency range is less than 1.5:1. Let me tell you, I tested the antenna at 146 MHz, 220 MHz and 450 MHz, and the worst swr obtained was 1.3:1—a very impressive performance.

The gain of the antenna is given at 3 dBi, and in a quick comparison between a quarter-wave vertical whip and the discone, the discone came out ahead by 2.8 dB. Considering that the measurement was relatively crude (even though it was done in an anechoic chamber), I probably would go along with the specifications given by TET.

Maximum power limit on this jewel is 500 Watts. The most impressive part of the antenna is the way it was built. The metal used is high-quality aluminum and the hardware used is all stainless steel. Assembly of the antenna took me about one hour (that includes two long-distance telephone interruptions) after figuring out the conversion from metric to inches (my tape measure is in inches). Mechanically, the antenna is about as strong as a mule, yet the unit only weighs 6.5 pounds.

The longest element, part of a radial, is 2200 mm (86.6"). This seven-foot radial is needed for 50-MHz operation. Photo B shows the top of the discone, and Photo C shows the insulator between the driven elements and the reflectors. It is made of a very hard and durable plastic, solid, and about 2 inches in diameter.

The antenna can be mounted on top of an HF monobander or tribander. It has about the same performance as a Ringo Ranger but much wider frequency operating range. This antenna will work very well

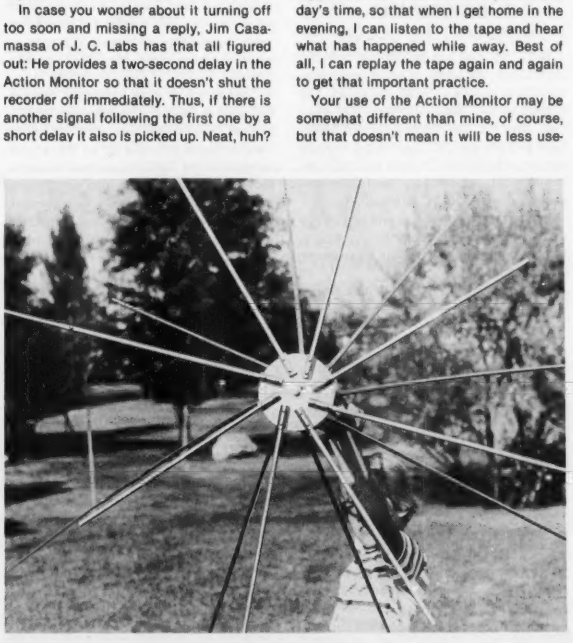

*Photo B. Top view of the discone.*

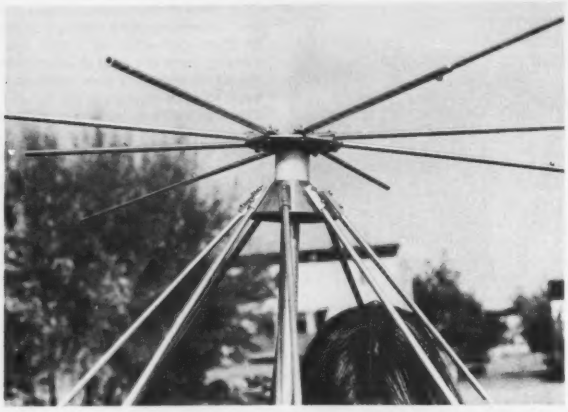

*Photo C. The two discs of the discone, top (radiator) and bottom (ground-plane reflector).*

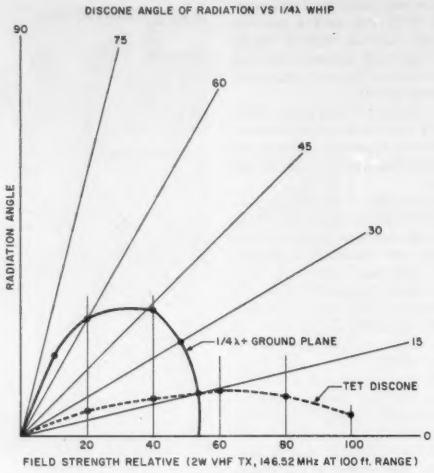


*Fig. 1. Angle of radiation relative to a quarter-wave vertical.*

on 2 meters, 220 MHz, and 450 MHz; it is vertically polarized, which makes it compatible with repeaters and FM simplex operation.

The angle of radiation is relatively low, at approximately 15° from the horizontal plane. Fig. 1 shows the angle of radiation relative to a quarter-wave vertical antenna. The GDX-2 is made with a metal coupling that mounts on the top of the SO-239 connector to protect such a connector from the weather.

For those of you willing to take the plunge, the antenna is now available from US TET distributors. (I bought this one from Sultronics, Inc., Xenia, Ohio.) The antenna was bought by DARA (Dayton Amateur Radio Association) for evaluation purposes; it was given as a door prize at one of the association meetings.

We paid the standard price of $79.95 for the antenna. Considering the wide bandwidth, the rugged construction, and its performance, the price is very good. The alternative would be to build three antennas and three feedlines plus connectors. The discone comes ahead financially after making the tradeoff.

For further information, contact *TET Antenna Systems, 1924-E W. Mission Road, Escondido CA 92025; (714)-743-7025.* Reader Service number 483.

**Al Torres KP4AQI**
**Technical Chairman**
**Dayton Amateur Radio Assn.**

**References**

1. *TET Antenna Systems*, GDX-2 Instruction Manual.
2. *ARRL Radio Amateur Handbook*, 1983 edition, p. 20–16 to 20–18.
3. Kraus, J. D., *Antennas*, McGraw-Hill Book Co., New York NY, 1950, p. 420–422.
4. *ARRL Antenna Handbook*, 1976 edition, p. 57.

# NEW PRODUCTS

## AEA RTTY SOFTWARE

AEA has released several new RTTY software packages for the Commodore machines. The MBAText is an advanced Morse, Baudot, and RTTY package for the VIC-20 or C-64, and includes a keyboard overlay for easy operation. The program includes RTTY and ASCII speed-estimate mode, as well as automatic speed tracking and lock-on capabilities. Dedicated function keys, message buffers, and hard-copy and magnetic media storage all make for easy, full-capability operation.

The AEA Micropatch™ is a low-cost Morse, Baudot, and ASCII software/hardware interface package. The Micropatch incorporates the MBAText software ROM, and adds dual-channel mark and space Chebyshev active filters. Automatic threshold correction makes for good copy when one tone is obliterated by QRM or selective fading. Several shifts are switch-selectable, and the triple-LED indicator creates an easy-tuning environment.

AEA has also produced two AMTOR products, the AMTORText™ and the MicroAMTOR Patch™. AMTORText will allow the Commodore 64 to be used as an AMTOR terminal with all the features. The menu-driven program makes it easy to run, and comes complete with SELCALL, ARQ, and break-in operation capabilities.

Combine the AMTORText program with high-quality hardware, and you get MicroAMTOR Patch. Four-pole active filters, automatic PTT, and an EXAR 2206 sine generator make this interface capable of copying through severe QRM.

For more information, contact *Advanced Electronic Applications, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

## BHC'S NEW BHC— THE BIG HAM CLOCK

BHC, Inc., has just introduced their Big Ham Clock, the latest of large liquid-crystal-display clocks in small packages. The clock has two large (5/8" tall) LCD modules, one for local time (12- or 24-hour type) and one for GMT. Each clock module can be programmed for your desired combination of: month/day, hours/minutes, seconds, and set to WWV (hack).

Each of the big modules will run one to three years on the replaceable battery. Both modules are mounted in a black anodized desk-top frame.

The Big Ham Clock is available from amateur radio dealers and distributors, or may be ordered directly from *BHC, Inc., 1716 Woodhead, Houston TX 77019.* Reader Service number 477.

*BHC's Big Ham Clock.*

## NEMAL'S SATELLITE CONTROL CABLE

Nemal Electronics International, Inc., has just introduced a new type of combination cable designed for the satellite television industry. As a supplier of cable, connectors, and SMATV products to the satellite television market for over seven years, Nemal has responded to a need for an all-purpose cable for TVRO installations.

Consisting of nine individual conductors plus a 96% copper-shielded RG59/U coaxial line, the Nemal SCC (Satellite Control Cable) provides for all the requirements of most TVRO equipment in one direct burial cable. On the nine conductors, there are five #22-gauge standard copper, two 22-gauge shielded with a third drain wire, and two #18-gauge wires. All wires are color coded to industry standards for easy identification.

Nemal SCC is available in 500- and 1000-foot rolls, as well as by the foot. For additional information, please contact *Nemal Electronics International, Inc., 12240 N.E. 14th Avenue, North Miami FL 33161; (305)-893-3924.* Reader Service number 478.

## INFORMATION PACKETS BY H. STEWART DESIGNS

H. Stewart Designs recently announced the availability of its design-information packet for a unique indoor antenna called the DX Hidden Asset Loop Antenna. This antenna is intended for use by apartment and condo dwellers, and others who are frustrated by antenna space restrictions. An antenna made from the information supplied has a vertically-polarized omnidirectional radiation pattern ideal for working mobiles and for DXing.

Intended for mounting in an attic or crawl space (and outdoors, too, if you should be lucky enough to have roof space available) a DX Hidden Asset Loop Antenna built for the ten-meter band would be only 40 inches tall and 55 inches in diameter. It is electrically balanced, independent of ground, and does not require radials or a ground connection.

Constructed from wire and other simple, readily-available materials, the DXHA looks like two four-foot halos arranged in a horizontal plane, mounted one above the other and separated by a little over three feet. The two loops are joined by two vertical wires spaced a few inches apart, and the coax feedline attaches to the center of one of the wires. Radiation is mainly from the verticals and, possibly, the antenna could be thought of as top-and-bottom-loaded radiators, although that has not been suggested by the literature.

If made from aluminum tubing and supported by some PVC pipe, it would appear as if the antenna could be self-supporting and well suited to outdoor mounting. H. Stewart Designs gives the construction for a wire-and-wood antenna but suggests that other possibilities exist. The informa-

tion package contains drawings, tables of dimensions, diagrams, and assembly/tuning instructions for several popular high-frequency amateur bands from two through fifteen meters.

We at *73* will be putting together a ten-meter version for evaluation and will report results in the Product Review section within a few months. Meanwhile, for further information, contact *H. Stewart Designs, PO Box 643, Oregon City OR 97045.* Reader Service number 481.

### *GUIDE TO RTTY FREQUENCIES*

Interest in monitoring RTTY signals in the shortwave spectrum has caught the fancy of thousands of hams and SWLs. Receiving RTTY signals has been greatly simplified through the use of computer technology and stable HF receiving equipment. In keeping pace with this explosive growth, the second edition of the *Guide to RTTY Frequencies* has double the amount of information and number of pages as the 1980 first edition.

Compiled and edited by O. P. Ferrell, the *Guide to RTTY Frequencies* details the frequency, callsign, location, power, speed, and shift, plus schedules of over 5000 RTTY stations and frequencies in use. The book is conveniently divided into two separate lists: the first by frequency, the second a reverse list by callsign. Included in the lists are military, weather, aeronautical, embassy, press, traffic, and coastal RTTY stations and nets. This is the most comprehensive listing of RTTY stations ever published.

The introductory text provides an overview of the techniques of RTTY reception with short articles on Russian Cyrillic, Hellschreiber, test signals, and an explanation of how to use the station lists. RTTY newscasts are given special consideration in the *Guide*. For the first time in print, the *Guide to RTTY Frequencies* gives definitive schedules, details on beam headings, "silent days," special shift patterns, etc. The author gives some advice on buying equipment just to copy RTTY newscasts, pointing out that the number of RTTY newscasts that can be monitored in North America has been steadily decreasing although activity in all other services is expanding.

For more information, contact *Gilfer Associates, Inc., 52 Park Avenue, PO Box 239, Park Ridge NJ 07656; (201)-391-7887.* Reader Service number 476.

*Microtec's dc-dc converter.*

### A 25-W AMPLIFIER FOR TWO METERS

Ham Industries, Inc., which recently expanded its product line, has announced the availability of its first ham product, the PA-25, a very compact 25-Watt amplifier for the 2-meter band.

Weighing 8 ounces, the PA-25 can be attached to a hand-held or mounted to a car dashboard with the accessory mounts included. It will boost output power up to 6 times for a hand-held transceiver. An adapter cord allows plugging into a cigarette lighter, or a separate power supply can be used.

To order, or to obtain further information, contact *Ham Industries, Inc., Inspection Products Division, 835 Highland Rd., Macedonia OH 44056, (212)-467-4256.* Reader Service number 479.

### THE MICROTEC 50DC1235 DC-DC CONVERTER

Magnum Distributors, Inc., has introduced another power-conversion product, the model 50DC1235, designed and manufactured by Microtec, Inc.

The model 50DC1235 is a commercial-grade, high-efficiency, high-current, continuous-duty, dc-dc converter. Specifications: 18–50-V-dc input, 13.8-V-dc output at 30 A. Continuous, 35 A intermittent (35 A continuous with forced air cooling); regulation: line 0.1% temp. 0.5%; output ripple and noise: less than 5 mV rms at max. load; efficiency: 83–90% input and output protection; size: 13.5" × 3.25" × 4.5"; weight: 5 lbs.; construction: all nonferrous, 1 year warranty. Complete specifications upon request.

For additional information and pricing, contact *Magnum Distributors, Inc., 1000 S. Dixie Hy. W. #3, Pompano Beach FL 33060; (305)-785-2002.* Reader Service number 480.

# CONTESTS

*Robert Baker WB2GFE*
*15 Windsor Dr.*
*Atco NJ 08004*

### 3RD ANNUAL 40-METER WORLD SSB CHAMPIONSHIP
### 0000Z to 2400Z
### January 7, 1984

*SPONSORED BY:*

*73: Amateur Radio's Technical Journal.*

*MISCELLANEOUS RULES:*

Work as many stations as possible on 40-meter phone during the specified times of allowable operation. The same station may be worked *once*. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

*OPERATOR CLASSES:*

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

*EXCHANGE:*

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

*POINTS:*

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

*MULTIPLIERS:*

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

*FINAL SCORE:*

Total QSO points times total multiplier points equals *claimed score.*

*CONTEST ENTRIES:*

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

*CONTEST DEADLINE:*

Each entry must be postmarked no later than February 12, 1984.

*DISQUALIFICATIONS:*

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

*AWARDS:*

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

*CONTEST ADDRESS:*

To obtain entry forms or to submit an entry, contact: 40-Meter Contest, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535.

## THE TSRAC BNT

### NEWSLETTER OF THE MONTH

"The A. R. *club* publication that *tries* to be different." That's the self-proclaimed motto of The Triple States Radio Amateur Club's *TSRAC BNT*, this month's contest winner. How are they different from most other newsletters?

Well, sure, they have news about club members and news about hamfests and special events. News about past and future happenings. "The Trading Post" classifieds. Some paid advertising. News (and a coupon) about a new Novice class. FCC and ARRL news. Articles (September issue) such as "Simulated Disaster Turns into the Real Thing" and "Helping the FCC at Midnight!" News about the newsletter itself—editorial and subscription info. Letters to the Editor. News "From the Editor's Desk" for readers. Some photos of hams in action. ARES news. A League membership application. More news.

Get the picture? News, news, news—crammed into this 24-page single-spaced issue. Editor Ralph McDonough K8AN's club doesn't get this award for news, though. They get it for taking the time and an awful lot of space to congratulate and recognize club members for their personal and club efforts. They *try* to be different by doing this and we feel that they more than succeed.

Our congratulations go out to Ralph, his helpers (however unsung), and *TSRAC* for a job very well done.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

### 3RD ANNUAL 75-METER WORLD SSB CHAMPIONSHIP
### 0000Z to 2400Z
### January 8, 1984

*SPONSORED BY:*

*73: Amateur Radio's Technical Journal.*

*MISCELLANEOUS RULES:*

Work as many stations as possible on 75-meter phone during the specified times of allowable operation. The same station may be worked *once*. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

*OPERATOR CLASSES:*

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

*EXCHANGE:*

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

*POINTS:*

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

*MULTIPLIERS:*

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

*FINAL SCORE:*

Total QSO points times total multiplier points equals *claimed score*.

*CONTEST ENTRIES:*

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

*CONTEST DEADLINE:*

Each entry must be postmarked no later than February 12, 1984.

*DISQUALIFICATIONS:*

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

*AWARDS:*

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

*CONTEST ADDRESS:*

To obtain entry forms or to submit an entry, contact: 75-Meter Contest, Jose A. Castillo N4BAA, 1832 Highland Drive, Amelia Island FL 32034.

## RATS NEST AND CROOKED STICK IV
### 2100Z January 8 to 0100Z January 9

This antenna experimenter's contest sprint is sponsored by the Issaquah Amateur Radio Club. A Rats Nest and Crooked Stick antenna is 100 feet maximum of single-conductor wire (solid or stranded), any configuration. Feedline will not have to count as part of the 100 feet unless it is coaxial cable. Antenna height is limited to *20 feet* at the center of high current, i.e., center of dipole, center of quad, base of 1/4-wave vertical. Transmitter power shall be 250 Watts or less (dc input).

*FREQUENCIES:*

CW—21.060 to 21.200 MHz.
SSB—21.350 to 21.450 MHz.

*EXCHANGE:*

Name, location (QTH), type of antenna, IARC member—yes or no.

*SCORING:*

CW contact—21.060 to 21.099 MHz, 5 points; CW contact—21.100 to 21.200 MHz, 10 points; SSB contact—21.350 to 21.450 MHz, 2 points.

A station may be contacted once on SSB and once on CW. Each dupe the contest committee finds is penalized by a loss of 10 points.

Bonus points awarded as follows: each new state worked, 3 points; worked all seventh-call-area states (8), 50 points; worked all states (50) 75 points; each new call area worked, 5 points; worked all ten US call areas, 35 points; 7 or more CW contacts, 25 points; 15 or more CW contacts, 75 points; each DX contact (KH6, KL7, VE, XE, JA, etc.), 5 points.

*CATEGORIES:*

1. Non-IARC member using a Rats Nest and Crooked Stick antenna. 2. IARC member using a Rats Nest and Crooked Stick antenna. 3. IARC member using a conventional base-station antenna. 4. A station making contact with three IARC members during contest.

*AWARDS:*

In each of the above categories 1, 2, and 3: A. High overall score. B. High CW score (without bonus). C. High SSB score (without bonus). D. High Novice/Technician score. E. Participant (1 hour or more operation).

In category 4: "Rat Catcher" certificate.

*ENTRIES:*

By February 1, 1984, submit summary sheet-points per mode, bonus points earned, total points earned, name, call, address, complete description of antenna and equipment used, license class. Log sheet—time, call, frequency, mode, exchange.

For Rat Catcher entries, submit log sheet showing three contacts with Issaquah Amateur Radio Club members during contest.

All correspondence must include an SASE sent to: Issaquah Amateur Radio Club, Bob Farnworth KB7NV, 6822 131st Ave. S.E., Bellevue WA 98006. All decisions of the contest committee will be final.

# CALENDAR

| | |
|---|---|
| **Jan 7** | **73 40-Meter World SSB Championship** |
| **Jan 8** | **73 75-Meter World SSB Championship** |
| **Jan 14–15** | **73 160-Meter World SSB Championship** |
| **Jan 14–15** | **Hunting Lions in the Air Contest** |
| **Jan 14–15** | **ARRL VHF Sweepstakes** |
| **Jan 20–22** | **A5 WAS SSTV Contest** |
| **Jan 21–22** | **North Dakota QSO Party** |
| **Jan 27–29** | **CQ Worldwide 160-Meter DX Contest—CW** |
| **Jan 28–29** | **Michigan YL QSO Party** |
| **Jan 28–Feb 5** | **ARRL Novice Roundup** |
| **Feb 4–5** | **South Carolina QSO Party** |
| **Feb 4–5** | **Arizona QSO Party** |
| **Feb 4–5** | **Vermont QSO Party** |
| **Feb 4–5** | **Zero-District QSO Party** |
| **Feb 11–12** | **Dutch PACC Contest** |
| **Feb 18–19** | **American Radio Club International DX Contest** |
| **Feb 18–19** | **YL-ISSB Commo System QSO Party—Phone** |
| **Feb 18–19** | **ARRL DX Contest—CW** |
| **Feb 24–26** | **CQ Worldwide 160-Meter DX Contest—SSB** |
| **Feb 25** | **RTTY World Championship** |
| **Mar 3–4** | **ARRL DX Contest—Phone** |
| **Mar 17–18** | **YL-ISSB Commo System QSO Party—CW** |
| **Mar 17–18** | **Bermuda Contest** |
| **Mar 17–18** | **Spring QRP CW Activity Weekend** |
| **Jul 13–15** | **A5 International SSTV-DX Contest** |
| **Aug 11–12** | **New Jersey QSO Party** |
| **Aug 24–27** | **A5 North American UHF FSTV-DX Contest** |
| **Sep 22–23** | **Late Summer QRP CW Activity Weekend** |

# RESULTS

## 1983 ARIZONA QSO PARTY

**Arizona Stations**

| Call | QTH | Score |
|---|---|---|
| *K6LL | Yuma County | 75,468 |
| *KB7KZ | Pima County | 16,965 |

**Non-Arizona Stations**

| | | |
|---|---|---|
| *W5PWG | Texas | 200 |
| W5WG | Louisiana | 170 |

* Certificate winner

## 5TH ANNUAL 160-METER WORLD SSB CHAMPIONSHIP
### 0000Z January 14, 1984 to 2400Z January 15, 1984

*SPONSORED BY:*

*73: Amateur Radio's Technical Journal.*

*OBJECT:*

To work as many stations as possible on 160-meter phone in a maximum of 32 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Stations may be worked only once.

*ENTRY CATEGORIES:*

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

*EXCHANGE:*

Stations within the continental US and Canada transmit RS report and state or province/territory. All others transmit RS report and DX country.

*POINTS:*

5 QSO points for contact with W/VE stations contacted within the continental 48 United States and Canada. All other contacts earn 10 points each.

*MULTIPLIERS:*

1 multiplier point will be earned for each of the continental United States, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each of the Canadian provinces/territories (13 maximum), and each DX country outside the continental 48 United States and Canada.

*FINAL SCORE:*

Total QSO points times total multiplier points equals *claimed score*.

*CONTEST ENTRIES:*

Each entry must include log sheets, dupe sheet for 100 or more contacts, a contest summary, and a multiplier check sheet.

*ENTRY DEADLINE:*

All entries must be postmarked no later than February 19, 1984.

*DX WINDOW:*

Stations are expected to observe the DX window from 1.825–1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band. During the contest, all W/VE stations are requested to utilize only those frequencies from 1.808–1.825 and 1.830–1.900 MHz.

*DISQUALIFICATIONS:*

Disqualification may result if a contestant omits any required entry form, operates in excess of legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which reduce the overall score more than 2%. Decisions of the contest committee are final.

*AWARDS:*

Contest awards will be issued in each entry category in each of the continental United States, each Canadian province/territory, and each DX country. A minimum of 100 QSOs must be worked to qualify.

*CONTEST ADDRESS:*

To obtain information or entry forms (enclose an SASE) or to submit a contest entry, contact: 160-Meter Contest, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505.

## HUNTING LIONS IN THE AIR CONTEST
### Starts: 1200 GMT January 14
### Ends: 1200 GMT January 15

The contest is sponsored by Lions Clubs International and coordinated by Lions Club Rio de Janeiro Arpoador, Brazil. Participation in the contest is open to all duly licensed radio operators, Lion and non-Lion. There are two modes: phone and CW. Participation in both modes is allowed but points are counted separately. All amateur stations participating must operate within their licensing regulation. Separate categories will exist for single operators and radio clubs/societies. Multi-operators may participate as long as they do not operate simultaneously with the same callsign. However, each callsign used must be listed on the log.

Use all bands, 80, 40, 20, 15, and 10 meters. Only one QSO with the same station on each band may be counted. Remember that phone and CW are counted separately!

*EXCHANGE:*

RS(T) and sequential QSO number. When a contact is made with any Lion, Leo, or Lioness, the name of the club contacted should be clearly identified.

*SCORING:*

QSOs within the same continent count 1 point while those between different continents count 3 points. Score 10 extra bonus points for each QSO with a member of a Lion, Lioness, or Leo Club from a different country or 5 points within the same country. Score 20 bonus points for a QSO with a member of the Lions Club Rio de Janeiro Arpoador. Contacts between Brazilian stations and members of the Arpoador club will count only 5 extra points. Contacts between members of the Arpoador club will not count any bonus points.

*AWARDS:*

For single-operator entries, Lions Clubs International will present trophies for first, second, and third places on both modes. Fourth through tenth places will receive plaques. In addition, each participant sending a log with a minimum of 5 contacts will receive a special certificate. The contest committee will also select and reward the most active Lions Club participating in the contest.

*ENTRIES:*

Keep a separate log for each mode. Each participant will note in the log the callsign and information exchanged. Confirmation of contacts will be made by comparing the logs of the participants. Participants should send their logs by airmail no later than Feb. 5 to: Contest Committee, Hunting Lions in the Air, Lions Club of Rio de Janeiro Arpoador, Rua Sao Francisco Xavier #246, Apt. 407, 22550 Rio de Janeiro, RJ, Brazil.

## A5 WAS SSTV CONTEST
### Starts: 1800 EDT January 20
### Ends: 1800 EDT January 22

This is the 3rd annual contest sponsored by *A5 ATV Magazine*. The object is to work as many different US states as possible on the video mode. All contacts must be in video form with a minimum of callsign and RSV signal reports sent and received. Count 10 points per SSTV QSO regardless of location, with 100 points awarded for each new state. Contacts with Alaska or Hawaii on SSTV count 500 points. Top scorer will receive a free 3-year subscription to *A5 ATV Magazine* with 1-year subscriptions going to District leaders. All entrants will receive a special gold specialized-communications certificate suitable for framing. Logs must be sent to: Contest Manager, *A5 ATV Magazine*, PO Box H, Lowden IA 52255. Indicate state and score on the front of the envelope. Logs and photos sent will be returned at the close of the contest judging period. Results should be published in the March or April, 1984, issue of *A5 ATV Magazine*.

## NORTH DAKOTA QSO PARTY
### 0000 to 0800 and 1600 to 2400 GMT January 21
### 0800 to 1600 GMT January 22

Sponsored again by the Red River Radio Amateurs of Fargo ND. Work stations once per band and mode.

*EXCHANGE:*

RS(T) and state, province, country, or North Dakota county.

*FREQUENCIES:*

Phone—1835, 3905, 7280, 14295, 21380, 28580.

CW—1810, 3540, 7035, 14035, 21035, 28035.

Novice—3725, 7125, 21125, 28125.

*SCORING:*

Phone contacts count 10 points, CW 20 points, and RTTY 50 points. North Dakota stations count an additional 100-point bonus for working five Novices. North Dakota stations multiply score by total of states, provinces, and countries worked. Others multiply by the number of North Dakota counties worked (max 53).

*ENTRIES & AWARDS:*

Certificates to state, province, and country winners. Plaque to North Dakota winner and highest scorer outside North Dakota. Mail logs by February 28th to: Mike Beaton KDØA, 2267 Flickertail Dr., Fargo ND 58103. Include a large SASE for results.

## CQ WORLDWIDE 160-METER CONTEST-CW
### Starts: 2200 GMT January 27
### Ends: 1600 GMT January 29

Operating classes include both single and multi-operator (maximum of 5 ops per station).

*EXCHANGE:*

RST plus QTH, and state for USA, province for Canadian.

*SCORING:*

Contacts with stations within own country are 2 points, other countries but same continent are 5 points, other continents are 10 points. KH6 and KL7 are considered countries.

Multipliers are each US state, VE province, and DX country. USA and Canada are *not* country multipliers. However, there are three VE1 provinces: New Brunswick, Nova Scotia, and Prince Edward Island. Final score is total QSO points times the sum of the multipliers. Maritime-mobile scoring will be determined by the location.

*AWARDS:*

Certificates to the top scorers in each class in each US state, VE province, and DX country. Special plaques are also being awarded for top USA, Europe, and world scores.

*PENALTIES:*

Three additional contacts will be deleted from the score for each duplicate, false, or unverifiable contact removed from the log. A second multiplier will also be removed for each one lost by this action.

Violation of the rules and regulations pertaining to amateur radio in the country of the contestant or the rules of the contest, unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Disqualified stations or operators may be barred from competing in *CQ* contests for a period of up to three years.

*ENTRIES:*

Sample log and summary sheets may be obtained from *CQ* by sending a large SASE with sufficient postage to cover your request. It is not necessary to use the official form, you can use your own. Logs should have 40 contacts per page and show time in GMT, numbers sent and received, and separate columns for QSO points and multipliers. Indicate the multiplier only the first time it is worked.

Include a summary sheet with your entry showing the scoring and other essential information, and a signed declaration that all rules and regulations have been observed. Mailing deadline for CW entries is Feb 28. Logs can be sent directly to the 160 Contest Director, Don McClenon N4IN, 3075 Florida Avenue, Melbourne FL 32901, USA. Alternatively, they can be sent to *CQ* 160-Meter Contest, 76 North Broadway, Hicksville NY 11801, USA. Please indicate "CW" on the envelope!

## MICHIGAN YL QSO PARTY
### Starts: 1800 GMT January 28
### Ends: 1800 GMT January 29

Sponsored by The Auto State Young Ladies (TASYLs). No crossband, net, or repeater QSOs are allowed. Each station can be contacted only once.

*EXCHANGE:*

RS(T), QTH, and TASYL number (for members).

*SCORING:*

Score one point per QSO and multiply by 2 if on CW. Multiply again by 2 if TASYL member. Multiply QSO points by number of different ARRL sections and DX countries worked.

*ENTRIES:*

Send logs to TASYL President Carol Hall WD8DQG, 4651 Cardinal Dr., Mt. Pleasant MI 48858. Entries must be received by February 25th.

The TASYL Certificate may also be earned during the QSO Party for working TASYL members. Charter members 1 thru 50 count 2 points while all other members count 1 point. Michigan stations need 15 points while others only need 10 points. To apply for the award, send a signed and dated log showing the date and time of contacts, callsigns, frequencies, RST, and TASYL numbers. Certification giving date and QTH must be on the original application and signed by one of the following: 2 licensed amateurs, General-class or higher (non-family), one official of a recognized club, or a notary public. Include $1 to cover mailing costs, etc., and submit applications to Carol Hall WD8DQG, 4651 Cardinal Drive, Mt. Pleasant MI 48858.

## 3RD ANNUAL RTTY WORLD CHAMPIONSHIP
### 0000Z to 2400Z
### February 25, 1984

*SPONSORED BY:*

*73 Amateur Radio's Technical Journal* and *The RTTY Journal*.

*OPERATOR CLASSES:*

(A) Single operator, single transmitter. (B) Multi-operator, single transmitter.

*ENTRY CATEGORIES:*

(A) Single band. (B) Allband, 10-80 meters.

*EXCHANGE:*

Stations within the 48 continental United States and Canada must transmit RST and state or province/territory. All others must transmit RST and consecutive contact number.

*MISCELLANEOUS RULES:*

The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work 16 hours maximum, while multi-operator stations may operate the entire 24-hour period. Off times are *no less* than 30 minutes each and must be noted in your log(s).

*QSO POINTS:*

5 QSO points for contacts with W/VE stations located within the continental United States and Canada. 10 QSO points for all other contacts.

*MULTIPLIER POINTS:*

1 multiplier point is awarded for each of the 48 continental United States (a District of Columbia contact may be substituted for a Maryland multiplier), Canadian provinces/territories, and DX countries worked on each band (excluding US and Canada).

*FINAL POINTS:*

Total QSO points times total multipliers equals *claimed score*.

*CONTEST ENTRIES:*

Entries must include a *separate* log for each band, a dupe sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

*ENTRY DEADLINE:*

All entries must be postmarked no later than April 15, 1984.

*DISQUALIFICATIONS:*

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

*AWARDS:*

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces/territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 QSOs must be worked to be eligible for awards.

*CONTEST ADDRESS:*

RTTY World Championship, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

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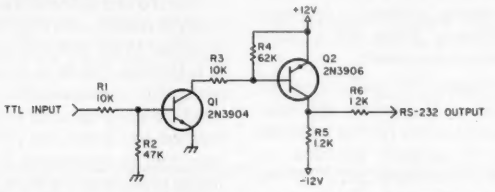
# CIRCUITS

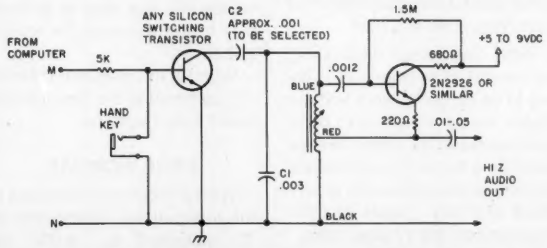
*Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.*

*In exchange for these technical gems, 73 offers you the choice of a book from the* Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices,* 73 Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

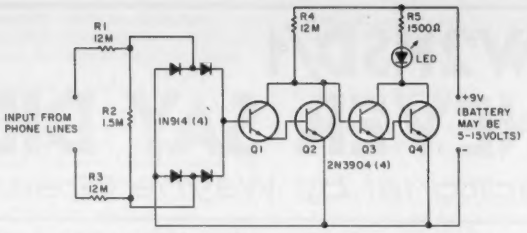
*STOP THAT ICOM BUZZ: If your IC-45A has been buzzing through the speaker or has been commanding itself to start or stop scanning, here is a simple fix. The regulator (IC-2) on the main board is the power supply for the whole radio. If it is not securely attached to the heat sink and if the board on which it sits is not firmly attached to the framework, the regulator filter will not function correctly. This will allow a buzz into the 8-V supply and will false the CPU into thinking that there was a command. Buzz may also occur in the audio. By tightening the four screws holding IC-2 to the heat sink, the filter will be allowed to work again. Some of the screws have a tendency to loosen, so a periodic check of them is in order.*—Rick Bates WA6NHC, Petaluma CA.



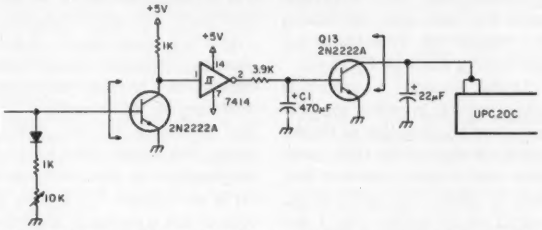

*SIMPLE TRANSISTOR TTL-TO-RS232 INTERFACE: This circuit can be used for driving an RS232 printer or RTTY interface from your computer or digital circuit. Transistor Q2 is the ± 12-V switch, which is driven by Q1. When the TTL input is low (mark condition), Q1 is turned off, which allows Q2 to be turned off. The RS232 output rests at − 12 volts (mark condition). When the TTL input is logic high (5 V), Q1 turns on and drives the base of Q2, turning it on. The RS232 output will then go to approximately + 12 V (space condition). Resistor R6 maintains a current limit in the event of an RS232 output short circuit. If the output were shorted without R6 in the circuit, the switch transistor Q2 would quickly burn out. The total cost of this simple interface is 32 cents.*—Scott M. Freeberg WA9WFA, Ft. Atkinson WI.



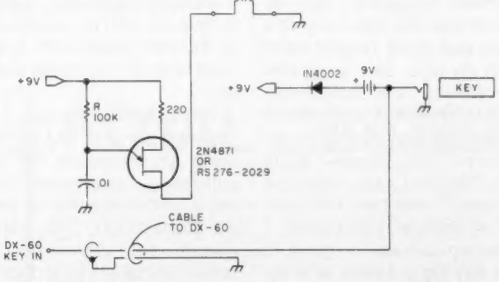

*RTTY OSCILLATOR FROM ORGAN PARTS: Using a tapped coil from the tone generator in a Conn organ, this circuit will generate the necessary 1275 and 1445 tones for RTTY. The coil I used (no. 57013) produced F sharp in the sixth octave; it should be available from a Conn organ repairman. Other coils may be used instead, but you must change the value of C2 to get the correct frequency. The circuit itself is a standard Hartley oscillator, and the coil adjustment is a standard 6-32 nut. Be sure to finish tuning in the tightening mode to ensure mechanical stability.*—Wm. Bruce Cameron WA4UZM, Temple Terrace FL.




*TELEPHONE OFF-HOOK INDICATOR: How many times have you started to dial a phone number only to find that the line was already in use? This visual indicator will signal when another person is dialing or talking on an extension and also provides a visual ring indicator. The LED flickers when the phone is ringing or being dialed. It glows steadily when the phone is off the hook. R1 and R2 isolate the system from the phone lines. They form a voltage divider with R3. The divider output feeds switch Q1-Q2. The switch senses less than 2 uA which the system draws from the phone line. That small current drops about three volts across R2 which keeps Q2 turned on. That keeps the second switch, Q3-Q4, and the LED turned off. But when the phone is taken off the hook, the line voltage falls, Q1-Q2 turns off, and Q3-Q4 turns on and lights the LED. Voltage changes caused by ringing and dialing also affect the switching, causing the LED to flicker.*—Evert Fruitman W7RXV, Phoenix AZ.




*FAST-ATTACK SQUELCH: This circuit was designed to provide a high-performance squelch for a nearby repeater which uses an IC-22A as a receiver. The Schmitt trigger provides a little hysteresis where it takes more signal energy to open the squelch than it takes to close it. Replace Q13 with a 2N222A in a TO-18 package, and leave the base lead out of the circuit board so that a wire can be attached to it later. C1 must be greater than 100 uF to eliminate popping noise around the squelch threshold, but the other parts values are not critical.*—Robert C. Lee WB0UBL, North Liberty IA.




*CW SIDETONE FOR THE DX-60: Here's a simple circuit which will work with any receiver and create a sidetone when you are keying the DX-60. Transformer T1 is an audio transformer. The unijunction transistor used as an oscillator may be any type; a 2N4871 or RS 276-2029 are good choices. Battery drain is practically nil, so a power switch is not needed, and you can change the pitch of the sidetone by changing the value of R.*—Terry Simonds WB4FXD, Edgartown MA.

# W2NSD/1
# NEVER SAY DIE
## editorial by Wayne Green

*from page 6*

nology, I'll let you know what's going on. In computers, the big push is for lap micros—the size of a ream of paper, but a lot lighter. This editorial is being written on a Tandy 100 lap computer.

The first system on the market along this line was the Sony Typecorder. But after almost a two-year lead on the field, Sony dropped the ball. An old CB manufacturing firm in Japan went the next step, producing the Tandy 100. This came out last spring, made by Kyocera.

Oddly enough, I described this computer in rather good detail when I gave a talk at the Atlanta Hamfestival in 1976. Later that year, I went over the idea with K. Mishi, the editor of *I/O* magazine in Japan. He, I am told, worked with Kyocera on its development. My part has probably been forgotten by now, but then, I'm used to that. It was my idea for splitting channels onto videotape which brought the first breakthrough by Ampex back in 1948. I'm sure that my idea has been long forgotten, but it was the one thing they needed to get started with videotape. At the time, I was working as a television engineer for WPIX in New York. I attended a TV seminar and talked with the engineers at Ampex. They explained that they were only able to get part of the needed bandwidth on tape, so I suggested heterodyning the frequencies down to where they could be put on tape and then putting the frequencies back together again later. They tried it and soon after we had 2" videotape from Ampex. No one even said thanks.

The lap computer is going to be a very big business, with opportunities for small firms to develop accessories and software for them—thousands of firms. But the next step is one which should be duck soup for hams—getting rid of the umbilical cord so these small computers can access a nearby computer system and use its storage, disks, and so on.

The next step, as I have written before, is a communications system which will allow all the desktop and lap computers to almost instantly communicate with each other. Something along the line of our repeater systems, which would receive messages, check them for errors and roger them, then pass them along to the addressee, complete with a return roger of the message receipt, is so obvious that it will have to happen.

In a few years, any of us who want to will be able to communicate with anyone anywhere from anywhere. It won't make any difference if I am walking along the street, shopping in Singapore, or in New Hampshire on a ski slope—I'll be able to type or talk a message and have it delivered in a second or two anywhere to anyone.

This is going to change business beyond recognition. It is going to have a profound effect on education. We can't even imagine what it will do for personal relationships. Oh, busy people will have to have filters built into the system. When my business was small I was available by phone at any time of the day or night. Today I'd be driven crazy with stockbrokers wanting to help me with my "portfolio" and investment counselors wanting to help me with my estate—not to mention people with investment ideas for my money and so on.

This communications demand is going to call for hundreds of thousands or even millions of technicians, engineers, and scientists to develop, manufacture, sell, install, operate, and service the systems it will take to do all this. It's mind-boggling in concept. We'll be using fiber optics, lasers, microwaves, satellites, and anything else we can invent to speed things up and make them less expensive. Amateurs are in a beautiful spot to get in on this bonanza. We can develop the communications system to do these things on our ham bands and then get started with small businesses, taking advantage of what we've developed. Or, we can bicker over the Morse code, get into pileups fighting for DX, and jam nets. I'm not sure these activities are any more beneficial to the world—or to amateur radio—than sitting back with two six packs of 807s and watching football on television.

The potential is there. My magazines can help you take advantage of that potential. Indeed, it is as a direct result of the pressures at Dayton, where hundreds of hams pleaded for a good Commodore magazine, that we've launched *RUN*. The first issue is due out in December and it looks as if it will sell well over 100,000 copies right off the bat.

I have a bunch more magazines in various stages of getting started just in case you don't smoke and are interested in getting involved in high-tech publishing. Some are in computers, some aren't.

Speaking of new magazines, while in Munich for the huge systems show (24 big buildings full of computer exhibits), we had a launching party for *PC Welt*, a German version of our sister magazine, *PC World*. Then on to Tokyo for the Data Show and the launching of a PC magazine there. A day later in Singapore, at a third computer show, it was *Computerworld Asia* getting started. And finally, after flying around the world and covering 32,000 miles in ten days, Comdex in Amsterdam and the launching of *Micro/Info*, a Dutch micro magazine—another associated publication of ours. Whew, what a trip!

With sunspots diminishing for several more years, DX is going to be harder to work and our higher bands are going to be of less interest. This seems like the ideal time for us to get cracking on new technologies—to experiment with new modes of communications and pioneer them.

Will we see automatic identification of rigs this year? It's certainly within our current level of technology to do this, complete with a reader on every receiver which will instantly read out the call of the received station—or even search for a desired station prefix.

With the development of packet communications, we may start having automatic message handling. We could have done that thirty years ago when I first started working with digital communications on the ham bands, but our national organization has done little to encourage such changes—and much to discourage them.

I'll be continuing to get on 20m as much as I can—and 2m from the various cities I visit. Sure, I'll be at Dayton this year. I don't know which other hamfests I'll make as yet. I've gotten to a lot of shows in the last year—consumer electronics shows in Tokyo, Seoul, Taipei, Hong Kong, and Vegas—computer shows in Anaheim, Tokyo, Taipei, Singapore, Munich, Amsterdam, Atlanta, Boston, New York, and so on. This year I'll be hitting more hamfests—hope to see you.

### INTERNATIONAL CORRESPONDENTS

First, I'd like to thank the hundreds of readers who have called or written to say that this feature is a favorite. We have 52 countries with correspondents and need more. I'll do what I can to find 'em as I travel, but you can help, too, by mentioning it over the air to some of the more interesting DX operators you get to know.

Some of the columnists have a tough job getting the information through—such as from Poland, for example. We really appreciate the job they're doing.

We have a truly international hobby and this column helps to bring us all together. We're interested in news of expeditions, special operations, certificates, how visitors can get permission to operate, how easy or difficult it is to get a license for locals, and so on.

With its international column, *73* has become the first international ham magazine.

### PRICE INCREASE

With a substantial increase in the international distribution of *73*—increased by 35,000 copies—we've had to increase the cover price from $2.495 to $2.50 so as not to drive foreign newsstands right out of their minds. We had enough trouble in America—worth every minute of it, by the way.

Speaking of DX, have you chosen a DX operator to send a subscription to?

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| 19 | 0132 | 114 | 0024 | 260 | 0042 | 271 | 0104 | 273 | 0033 | 259 | 19 |
| 20 | 0136 | 115 | 0019 | 260 | 0027 | 269 | 0055 | 272 | 0030 | 260 | 20 |
| 21 | 0140 | 116 | 0014 | 260 | 0012 | 267 | 0045 | 271 | 0027 | 261 | 21 |
| 22 | 0002 | 92 | 0008 | 260 | 0155 | 294 | 0036 | 270 | 0024 | 262 | 22 |
| 23 | 0006 | 93 | 0003 | 261 | 0140 | 292 | 0026 | 269 | 0021 | 263 | 23 |
| 24 | 0010 | 94 | 0157 | 291 | 0124 | 289 | 0016 | 268 | 0018 | 263 | 24 |
| 25 | 0015 | 95 | 0152 | 291 | 0109 | 287 | 0007 | 267 | 0016 | 264 | 25 |
| 26 | 0019 | 96 | 0147 | 291 | 0053 | 285 | 0156 | 296 | 0013 | 265 | 26 |
| 27 | 0023 | 97 | 0141 | 291 | 0038 | 282 | 0146 | 295 | 0010 | 266 | 27 |
| 28 | 0028 | 98 | 0136 | 291 | 0022 | 280 | 0137 | 294 | 0007 | 267 | 28 |
| 29 | 0032 | 99 | 0131 | 292 | 0007 | 278 | 0127 | 294 | 0004 | 268 | 29 |
| 30 | 0036 | 101 | 0125 | 292 | 0150 | 305 | 0117 | 293 | 0001 | 268 | 30 |
| 31 | 0041 | 102 | 0120 | 292 | 0135 | 303 | 0108 | 292 | 0158 | 299 | 31 |
| Feb 1 | 0045 | 103 | 0115 | 292 | 0120 | 300 | 0058 | 291 | 0156 | 300 | 1 |
| 2 | 0049 | 104 | 0109 | 292 | 0104 | 298 | 0048 | 290 | 0153 | 301 | 2 |
| 3 | 0054 | 105 | 0104 | 293 | 0049 | 296 | 0039 | 289 | 0150 | 302 | 3 |
| 4 | 0058 | 106 | 0059 | 293 | 0033 | 294 | 0029 | 288 | 0147 | 303 | 4 |
| 5 | 0102 | 107 | 0053 | 293 | 0018 | 291 | 0020 | 287 | 0144 | 303 | 5 |
| 6 | 0107 | 108 | 0048 | 293 | 0003 | 289 | 0010 | 286 | 0141 | 304 | 6 |
| 7 | 0111 | 110 | 0043 | 293 | 0146 | 316 | 0000 | 286 | 0139 | 305 | 7 |
| 8 | 0115 | 111 | 0037 | 294 | 0130 | 314 | 0150 | 315 | 0136 | 306 | 8 |
| 9 | 0120 | 112 | 0032 | 294 | 0115 | 312 | 0140 | 314 | 0133 | 307 | 9 |
| 10 | 0124 | 113 | 0027 | 294 | 0100 | 309 | 0130 | 313 | 0130 | 307 | 10 |
| 11 | 0128 | 114 | 0021 | 294 | 0044 | 307 | 0121 | 312 | 0127 | 308 | 11 |
| 12 | 0133 | 115 | 0016 | 294 | 0029 | 305 | 0111 | 311 | 0124 | 309 | 12 |

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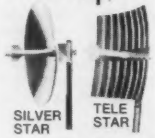

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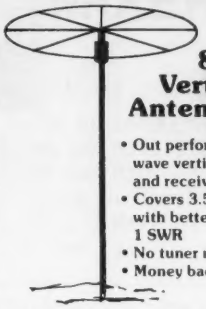

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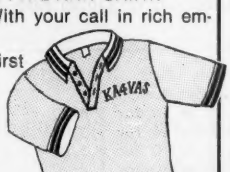


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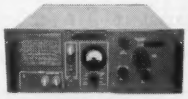

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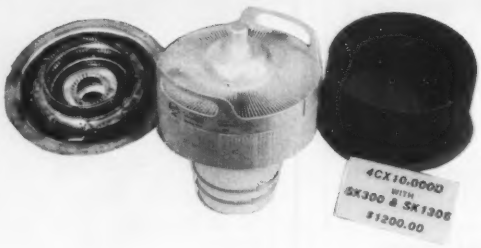


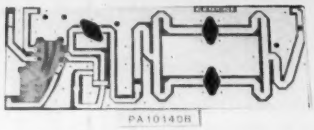


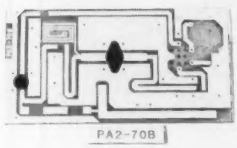


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| 2N3818 | 5.00 |
| 2N3866 | 1.30 |
| 2N3866JAN | 2.20 |
| 2N3924 | 3.35 |
| 2N3927 | 17.25 |
| 2N3950 | 25.00 |
| 2N4012 | 11.00 |
| 2N4041 | 14.00 |
| 2N4072 | 1.80 |
| 2N4080 | 4.53 |
| 2N4127 | 21.00 |
| 2N4427 | 1.30 |
| 2N4428 | 1.85 |
| 2N4430 | 11.80 |
| 2N4957 | 3.45 |
| 2N4959 | 2.30 |
| 2N5090 | 13.80 |
| 2N5108 | 3.45 |
| 2N5109 | 1.70 |
| 2N5160 | 3.45 |
| 2N5177 | 21.62 |
| 2N5179 | 1.04 |
| 2N5216 | 56.00 |
| 2N5583 | 3.45 |
| 2N5589 | 9.77 |
| 2N5590 | 10.92 |
| 2N5591 | 13.80 |
| 2N5637 | 15.50 |
| 2N5641 | 12.42 |
| 2N5642 | 14.03 |
| 2N5643 | 15.50 |
| 2N5645 | 13.80 |
| 2N5646 | 20.70 |
| 2N5651 | 11.05 |
| 2N5691 | 18.00 |
| 2N5764 | 27.00 |
| 2N5836 | 3.45 |
| 2N5842/MM1607 | 8.45 |
| 2N5849 | 20.00 |
| 2N5913 | 3.25 |
| 2N5916 | 36.00 |
| 2N5922 | 10.00 |
| 2N5923 | 25.00 |
| 2N5941 | 23.00 |
| 2N5942 | 40.00 |
| 2N5944 | 10.35 |
| 2N5945 | 11.50 |
| 2N5946 | 14.40 |
| 2N6080 | 10.35 |
| 2N6081 | 12.07 |
| 2N6082 | 12.65 |
| 2N6083 | 13.25 |
| 2N6084 | 15.00 |
| 2N6094 | 11.00 |
| 2N6095 | 12.00 |
| 2N6096 | 16.10 |
| 2N6097 | 20.70 |
| 2N6105 | 21.00 |
| 2N6136 | 21.85 |
| 2N6166 | 40.24 |
| 2N6201 | 50.00 |
| 2N6304 | 1.50 |
| 2N6459 | 18.00 |
| 2N6567 | 10.06 |
| 2N6680 | 80.00 |
| 2SC703 | 3.00 |
| 2SC756A | 7.50 |
| 2SC781 | 2.80 |
| 2SC1018 | 1.00 |
| 2SC1042 | 12.00 |
| 2SC1070 | 2.50 |
| 2SC1239 | 2.50 |
| 2SC1251 | 12.00 |
| 2SC1306 | 2.90 |
| 2SC1307 | 5.50 |
| 2SC1424 | 2.80 |
| 2SC1678 | $ 2.00 |
| 2SC1729 | 20.00 |
| 2SC1760 | 1.50 |
| 2SC1909 | 4.00 |
| 2SC1946 | 36.00 |
| 2SC1946A | 40.00 |
| 2SC1970 | 2.50 |
| 2SC1974 | 4.00 |
| 2SC2166 | 5.50 |
| 2SC2237 | 32.00 |
| 2SC2695 | 47.00 |
| A50-12 | 25.00 |
| A209 | 10.00 |
| A283 | 5.00 |
| A283B | 6.00 |
| AF102 | 2.50 |
| AFY12 | 2.50 |
| BF272A | 2.50 |
| BFR21 | 2.50 |
| BFR90 | 1.00 |
| BFR91 | 1.65 |
| BFR99 | 2.50 |
| BFT12 | 2.50 |
| BFW16A | 2.50 |
| BFW17 | 2.50 |
| BFW92 | 1.50 |
| BFX44 | 2.50 |
| BFX48 | 2.50 |
| BFX65 | 2.50 |
| BFX84 | 2.50 |
| BFX85 | 2.50 |
| BFX86 | 2.50 |
| BFX89 | 1.00 |
| BFY11 | 2.50 |
| BFY18 | 2.50 |
| BFY19 | 2.50 |
| BFY39 | 2.50 |
| BFY90 | 1.00 |
| BLX67 | 15.24 |
| BLX68C3 | 15.24 |
| BLX93C3 | 22.21 |
| BLY87A | 8.94 |
| BLY88C3 | 13.08 |
| BLY94C | 21.30 |
| BLY351 | 10.00 |
| BLY568C/CF | 30.00 |
| C458-617 | 25.00 |
| C4005 | 20.00 |
| CD1899 | 20.00 |
| CD2188 | 18.00 |
| CD2545 | 25.00 |
| CTC3005 | 100.00 |
| Dexcel GaAs FET | |
| DXL3501A-P100F | 49.30 |
| Fujitsu GaAs FET | |
| FSX52WF | 58.00 |
| GMC290A | 2.50 |
| HEP76 | 4.95 |
| HEPS3002 | 11.40 |
| HEPS3003 | 30.00 |
| HEPS3005 | 10.00 |
| HEPS3006 | 19.90 |
| HEPS3007 | 25.00 |
| HEPS3010 | 11.34 |
| Hewlett Packard | |
| HFET2204 | 112.00 |
| 35821E | 38.00 |
| 35826B | 32.00 |
| 35826E | 32.00 |
| 35831E-H31 | 30.00 |
| 35831E | 30.00 |
| 35832E | 50.00 |
| 35833E | 50.00 |
| 35853E | 71.50 |
| 35854E | 75.00 |
| 35866E | 44.00 |
| HXTR3101 | 7.00 |
| HXTR3102 | 8.75 |
| HXTR5104 | 30.00 |
| HXTR6104 | 68.00 |
| HXTR6105 | 31.00 |
| HXTR6106 | 33.00 |
| J310 | .70 |
| TRW | |
| JQ2000 | 10.00 |
| JQ2001 | 25.00 |
| JO4045 | 25.00 |
| Motorola Comm. | |
| M1131 | 8.50 |
| M1132 | 11.95 |
| M1134 | $ 16.90 |
| M9579 | 7.95 |
| M9588 | 7.50 |
| M9622 | 7.95 |
| M9623 | 9.95 |
| M9624 | 11.95 |
| M9625 | 17.95 |
| M9630 | 18.00 |
| M9740 | 29.90 |
| M9741 | 29.90 |
| M9755 | 19.50 |
| M9848 | 37.00 |
| M9850 | 16.90 |
| M9851 | 20.00 |
| M9887 | 5.25 |
| MEL80091 | 25.00 |
| MM1550 | 10.00 |
| MM1552 | 50.00 |
| MM1553 | 50.00 |
| MM1614 | 10.00 |
| MM1943/2N4072 | 1.80 |
| MM2608 | 5.00 |
| MM3375A | 17.10 |
| MM4429 | 10.00 |
| MM8000 | 1.15 |
| MM8006 | 2.30 |
| MM8011 | 25.00 |
| MPF102 | .45 |
| MPSU31 | 1.01 |
| MRA2023-1.5 | 42.50 |
| MRF208 | 16.10 |
| MRF212 | 16.10 |
| MRF223 | 13.25 |
| MRF224 | 15.50 |
| MRF231 | 10.92 |
| MRF232 | 12.07 |
| MRF233 | 12.65 |
| MRF237 | 3.15 |
| MRF238 | 13.80 |
| MRF239 | 17.25 |
| MRF245 | 35.65 |
| MRF247 | 35.65 |
| MRF304 | 43.45 |
| MRF309 | 33.81 |
| MRF314 | 28.52 |
| MRF315 | 28.86 |
| MRF316 | POR |
| MRF317 | 63.94 |
| MRF420 | 20.00 |
| MRF421 | 36.80 |
| MRF422A | 41.40 |
| MRF427 | 17.25 |
| MRF428 | 46.00 |
| MRF433 | 12.07 |
| MRF449/A | 12.65 |
| MRF450/A | 14.37 |
| MRF453/A | 18.40 |
| MRF454/A | 20.12 |
| MRF455/A | 16.00 |
| MRF458 | 20.70 |
| MRF463 | 25.00 |
| MRF472 | 1.00 |
| MRF475 | 3.10 |
| MRF476 | 2.00 |
| MRF477 | 14.95 |
| MRF492 | 23.00 |
| MRF502 | 1.04 |
| MRF503 | 6.00 |
| MRF504 | 7.00 |
| MRF509 | 5.00 |
| MRF511 | 10.69 |
| MRF515 | 2.00 |
| MRF517 | 2.00 |
| MRF559 | 2.05 |
| MRF605 | 20.00 |
| MRF618 | 25.00 |
| MRF628 | 8.65 |
| MRF629 | 3.45 |
| MRF644 | 27.60 |
| MRF646 | 29.90 |
| MRF816 | 15.00 |
| MRF823 | 20.00 |
| MRF901 (3) Lead | 1.00 |
| MRF901 (4) Lead | 2.00 |
| MRF904 | 2.30 |
| MRF911 | 3.00 |
| MRF961 | 2.30 |
| MRF8004 | 2.10 |
| MS261F | POR |
| MSC1720-12 | 225.00 |
| MSC1821-3 | $125.00 |
| MSC1821-10 | 225.00 |
| MSC2001 | 40.00 |
| MSC2223-10 | 200.00 |
| MSC3000 | 50.00 |
| MSC3001 | 50.00 |
| MSC73001 | 50.00 |
| MSC82001 | 40.00 |
| MSC82014 | 40.00 |
| MSC82020 | 40.00 |
| MSC82030 | 40.00 |
| MSC83001 | 50.00 |
| MSC83005 | 100.00 |
| MT4150 | 14.40 |
| MT5126 | POR |
| MT5596/2N5596 | 99.00 |
| MT5768/2N5768 | 95.00 |
| MT8762 | POR |
| NE02136 | 2.50 |
| NE13783 | POR |
| NE21889 | POR |
| NE57835 | 5.70 |
| NE73436 | 2.50 |
| TRW | |
| PRT8637 | POR |
| PT3190 | POR |
| PT3194 | POR |
| PT3195 | POR |
| PT3537 | 7.80 |
| PT4166E | POR |
| PT4176D | POR |
| PT4186B | POR |
| PT4209 | POR |
| PT4209C/5645 | POR |
| PT4556 | 24.60 |
| PT4570 | 7.50 |
| PT4577 | POR |
| PT4590 | POR |
| PT4612 | POR |
| PT4628 | POR |
| PT4640 | POR |
| PT4642 | POR |
| PT5632 | 4.70 |
| PT5749 | POR |
| PT6629 | POR |
| PT6709 | POR |
| PT6720 | POR |
| PT8510 | POR |
| PT8524 | POR |
| PT8609 | POR |
| PT8633 | POR |
| PT8639 | POR |
| PT8659 | POR |
| PT8679 | POR |
| PT8708 | POR |
| PT8709 | POR |
| PT8727 | 29.00 |
| PT8731 | POR |
| PT8742 | 19.10 |
| PT8787 | POR |
| PT9783 | 16.50 |
| PT9784 | 32.70 |
| PT9790 | 56.00 |
| PT31962 | POR |
| PT31963 | POR |
| PT31083 | POR |
| PTX6680 | POR |
| RCA | |
| 40081 | 5.00 |
| 40279 | 10.00 |
| 40280 | 4.62 |
| 40281 | 10.00 |
| 40282 | 20.00 |
| 40290 | 2.80 |
| 40292 | 13.05 |
| 40294 | 2.50 |
| 40341 | 21.00 |
| 40608 | 2.48 |
| 40894 | 1.00 |
| 40977 | 10.00 |
| 62800A | 60.00 |
| RE3754 | 25.00 |
| RE3789 | 25.00 |
| RF110 | 25.00 |
| S50-12 | 25.00 |
| S3006 | 5.00 |
| S3031 | 5.00 |
| SCA3522 | 5.00 |
| SCA3523 | 5.00 |
| PRICE ON REQUEST = POR | |

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**MHz electronics**

# GaAs, TUNNEL DIODES, ETC.

| PART | PRICE |
|---|---|
| MA47100 | $ 3.05 |
| MA47202 | 30.80 |
| MA47771 | POR |
| MA47852 | POR |
| MA49558 | POR |
| MB4021 | POR |
| MBD101 | 1.00 |
| MDO513 | POR |
| MHW1171 | 42.50 |
| MHW1182 | 48.60 |
| MHW4171 | 49.35 |
| MHW4172 | 51.90 |
| MHW4342 | 68.75 |
| MLP102 | 25.00 |
| MM1500 | 32.32 |
| MM1550 | POR |
| MM1552 | 50.00 |
| MM1553 | 50.00 |
| MM1614 | 10.00 |
| MM2608 | 5.00 |
| MM3375A | 11.50 |
| MM4429 | 10.00 |
| MM8000 | 1.15 |
| MM8006 | 2.30 |
| MO277L | POR |
| MO283L | POR |
| MO3757 | POR |
| MP102 | POR |
| MPN3202 | 10.00 |
| MPN3401 | .52 |
| MPN3412 | 1.00 |
| MPSU31 | 1.01 |
| MRA2023-1.5 TRW | 42.50 |
| MRF212/208 | 16.10 |
| MRF223 | 13.25 |
| MRF224 | 15.50 |
| MRF237 | 3.15 |
| MRF238 | 12.65 |
| MRF243 | 25.00 |
| MRF245 | 34.50 |
| MRF247 | 34.50 |
| MRF304 | 43.45 |
| MRF315 | 23.00 |
| MRF420 | 20.00 |
| MRF421 | 36.80 |
| MRF422 | 41.40 |
| MRF427 | 16.10 |
| MRF428 | 46.00 |
| MRF450/A | 13.80 |
| MRF453/A | 17.25 |
| MRF454/A | 19.90 |
| MRF455/A | 16.00 |
| MRF458 | 19.90 |
| MRF463 | 25.00 |
| MRF472 | 1.00 |
| MRF475 | 2.90 |
| MRF477 | 11.50 |
| MRF502 | 1.04 |
| MRF503 | $ 6.00 |
| MRF504 | 7.00 |
| MRF509 | 5.00 |
| MRF511 | 8.65 |
| MRF605 | 20.00 |
| MRF629 | 3.47 |
| MRF644 | 23.00 |
| MRF816 | 15.00 |
| MRF823 | 20.00 |
| MRF901 | 3.00 |
| MRF8004 | 2.10 |
| MS261F | POR |
| MT4150 Fair. | POR |
| MT5126 Fair. | POR |
| MT5481 Fair. | POR |
| MT5482 Fair. | POR |
| MT5483 Fair. | POR |
| MT5596 Fair. | POR |
| MT5764 Fair. | POR |
| MT8762 Fair. | POR |
| MV109 | .77 |
| MV1401 | 8.75 |
| MV1624 | 1.42 |
| MV1805 | 15.00 |
| MV1808 | 10.00 |
| MV1817B | 10.00 |
| MV1863B | 10.00 |
| MV1864A | 10.00 |
| MV1864B | 10.00 |
| MV1864D | 10.00 |
| MV1868D | 10.00 |
| MV2101 | .90 |
| MV2111 | .90 |
| MV2115 | 1.55 |
| MV2201 | .53 |
| MV2203 | .53 |
| MV2209 | 2.00 |
| MV2215 | 2.00 |
| MWA110 | 7.45 |
| MWA120 | 7.80 |
| MWA130 | 8.25 |
| MWA210 | 7.80 |
| MWA220 | 8.25 |
| MWA230 | 8.65 |
| MWA310 | 8.25 |
| MWA320 | 8.65 |
| MWA330 | 9.50 |
| NEC57835 | 5.30 |
| ON382 | 5.00 |
| PPT515-20-3 | POR |
| PRT8637 | POR |
| PSCQ2-160 | POR |
| PT3190 | POR |
| PT3194 | POR |
| PT3195 | POR |
| PT3537 | POR |
| PT4166E | POR |
| PT4176D | POR |
| PT4186B | $ POR |
| PT4209 | POR |
| PT4209C | POR |
| PT4566 | POR |
| PT4570 | POR |
| PT4571 | POR |
| PT4571A | POR |
| PT4577 | POR |
| PT4590 | POR |
| PT4612 | POR |
| PT4628 | POR |
| PT4640 | POR |
| PT4642 | POR |
| PT5632 | POR |
| PT5749 | POR |
| PT6612 | POR |
| PT6626 | POR |
| PT6709 | POR |
| PT6720 | POR |
| PT8510 | POR |
| PT8524 | POR |
| PT8609 | POR |
| PT8633 | POR |
| PT8639 | POR |
| PT8659 | POR |
| PT8679 | POR |
| PT8708 | POR |
| PT8709 | POR |
| PT8727 | POR |
| PT8731 | POR |
| PT8742 | POR |
| PT8787 | POR |
| PT9790 | 41.70 |
| PT31962 | POR |
| PT31963 | POR |
| PT31983 | POR |
| PTX6680 | POR |
| RAY-3 | 24.99 |
| 40081 | POR |
| 40281 | POR |
| 40282 | POR |
| 40290 | POR |
| RF110 | 25.00 |
| SCA3522 | POR |
| SCA3523 | POR |
| SD1065 | POR |
| SS43 | POR |
| TP1014 | POR |
| TP1028 | POR |
| TRW-3 | POR |
| UTO504 Avantek | 70.00 |
| UTO511 Avantek | 75.00 |
| V15 | 4.00 |
| V33B | 4.00 |
| V100B | 4.00 |
| VAB801EC | 25.00 |
| VAB804EC | 25.00 |
| VAS21AN20 | 25.00 |

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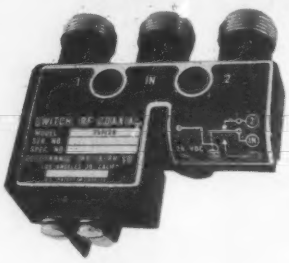
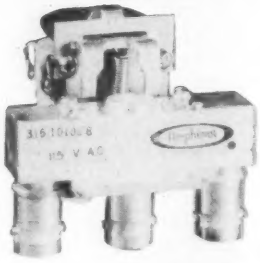
COAXIAL RELAY SWITCHES SPDT

Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.



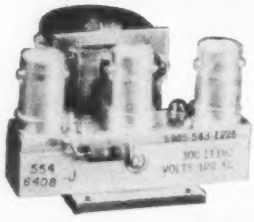
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



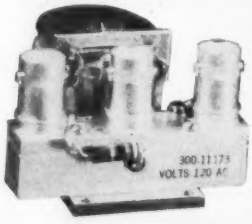
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99




BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00 $8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

| | | |
|---|---|---|
| P&B Model ECT1DB72<br>PRICE EACH $5.00 | 5vdc turn on | 120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease. |
| Digisig, Inc. Model ECS-215<br>PRICE EACH $7.50 | 5vdc turn on | 240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease. |
| Grigsby/Barton Model GB7400<br>PRICE EACH $7.50 | 5vdc turn on | 240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease. |

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

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RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

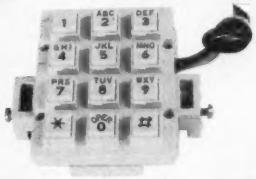
The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.)
$2.00

TOUCH TONE PAD

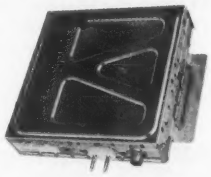
This pad contains all the electronics to produce standard touch-tone tones. New with data.



$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

| INTEGRATED CIRCUIT | | 1 to 10 | 11up |
|---|---|---|---|
| MC1372P | Color TV Video Modulator Circuit. | $ 4.42 | $2.95 |
| MC1358P | IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator. | 5.00 | 4.00 |
| MC1350P | IF Amplifier | 1.50 | 1.25 |
| MC1330A1P | Low Level Video Detector | 1.50 | 1.15 |
| MC1310P | FM Stereo Demodulator | 4.29 | 3.30 |
| MC1496P | Balanced Modulator/Demodulator | 1.50 | 1.25 |
| LM565N | Phase Locked Loop | 2.50 | 2.00 |
| LM380N14 | 2Watt Audio Power Amplifier | 1.56 | 1.25 |
| LM1889N | TV Video Modulator | 5.00 | 4.00 |
| NE564N | Phase Locked Loop | 10.00 | 8.00 |
| NE561N | Phase Locked Loop | 10.00 | 8.00 |

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.
Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR
hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
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| | | $POR |
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| SK300A | Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J | $520.00 |
| SK400 | Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A | 260.00 |
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| SK416 | Chimney For 3-400Z | 36.00 |
| SK500 | Socket For 4-1000A/4PR1000A/B | 390.00 |
| SK600 | Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ | 51.00 |
| SK602 | Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ | 73.00 |
| SK606 | Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ | 11.00 |
| SK607 | Socket For 4CX600J,JA | 60.00 |
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| SK636B | Chimney For 4CX600J,JA | 34.00 |
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| SK700 | Socket For 4CX300A,Y,4CX125C,F | 225.00 |
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| SK770 | Socket For 4CX300A,Y,4CX125C,F | 86.00 |
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| SK806 | Chimney For 4CX1000A,4CX1500B | 40.00 |
| SK810 | Socket For 4CX1000A,4CX1500B | 225.00 |
| SK900 | Socket For 4X500A | 300.00 |
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| SK1420 | Socket For 5CX3000A | 650.00 |
| SK1490 | Socket For 4CV8000A | 585.00 |

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|---|---|---|---|
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| 1pf | 12pf | 110pf | 470pf |
| 1.1pf | 15pf | 120pf | 510pf |
| 1.4pf | 18pf | 130pf | 560pf |
| 1.5pf | 20pf | 150pf | 620pf |
| 1.8pf | 22pf | 160pf | 680pf |
| 2.2pf | 24pf | 180pf | 820pf |
| 2.7pf | 27pf | 200pf | 1000pf/.001uf* |
| 3.3pf | 33pf | 220pf* | 1800pf/.0018uf |
| 3.6pf | 39pf | 240pf | 2700pf/.0027uf |
| 3.9pf | 47pf | 270pf | 10,000pf/.01uf |
| 4.7pf | 51pf | 300pf | 12,000pf/.012uf |
| 5.6pf | 56pf | 330pf | 15,000pf/.015uf |
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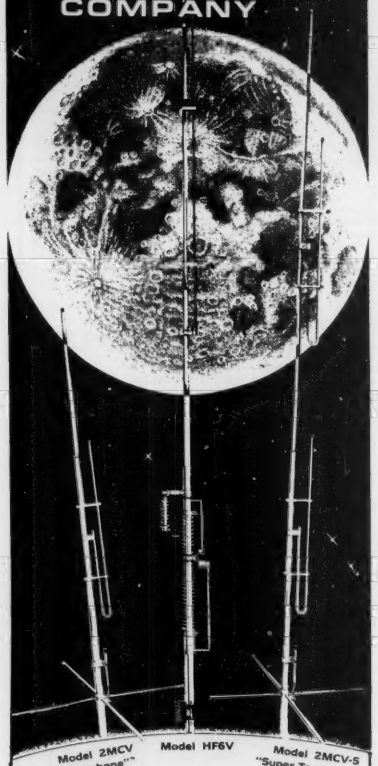

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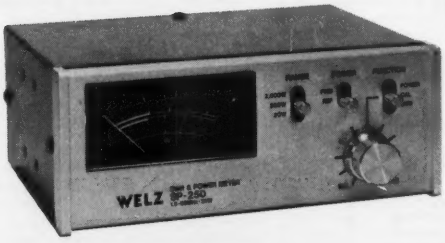

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# WELZ

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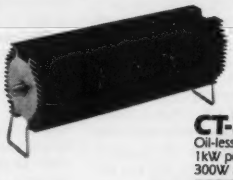

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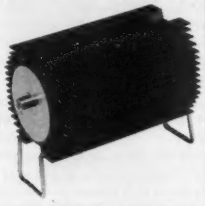

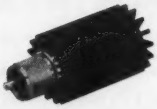

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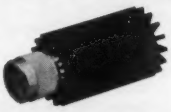

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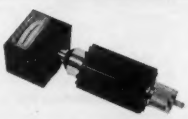

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# 73 INTERNATIONAL

*from page 80*

1914 km on 1296 MHz and 1663 km on 10 GHz!

Last summer that worldwide-known GHz DXer bettered a fantastic world record of 1166 km on 10 GHz from Sagunto, Spain, to Italy. On July 2nd, Nicola joined I0SC and I0KBL in Ceuta. With them was Bernardo EA5RK. Nicola's car hauled a trailer with gear for 144 MHz, HF, and the GHz transceivers.

They met many hams from Ceuta, EA9LT, EA9GH, EA9KF, EA9LV, and EA9GH, who gave their assistance, providing permission to install the setup and the antennas on the Ceuta lighthouse, 400 feet above sea level.

● July 4—Nicola starts with two QSOs on 144 MHz MS, contacting I4BXN and F6FHI.

● July 5—There is an E-sporadic aperture: Nicola contacts on 144 MHz several YUs and Is with signals far in excess of S9. These are the first EA9-YU QSOs in history. At 1507Z, a contact is established on 1296 MHz with I8TUS/8. The QRB is 1914 km, a world record.

● July 6—At 1052, an ES contact with 9H1CG, a new one on 144 between EA9 and 9H. Then dozens of ES contacts with Italy and Yugoslavia. The signals are terrific: The S-meter is pinning up to full scale. At 1804, another new one with G4IJE; then, at 1845, GI4TAP (first QSO EA9-GI); at 1847, EI2CA, and at 1917, GW8FKB (two new ones with EA9).

● July 7—A one-hour opening on 1296 and many QSOs with Sicily. I0HOC/IT9 displays in Ceuta a signal of S9+20. Giuseppe has gone portable from Rome to Sicily just to try the contact!

Then the magic moments: At 1600, the contact is established with fair signals with IW0BCU/IT9, France, with a QRB of 1621 km! After seven minutes, again the record with I0NLK/IT9. The entire Roma Microwave Gang was in Sicily to attend the I0SNY enterprise.

Three hours after the record is filed, a new contact with I0NLK/IE9, Isle of Ustica, brings the record to 1663 km, almost 500 km more than the 1982 record from Sagunto to Rome. The day is not ended, as IW0BHN is contacted on 10 GHz: 1603 km, not a record but great DX!

● 9 and 10 July—The team is now in Morocco and gets several new contacts from that country on 144 and 432 MHz. But the most interesting QSO is the contact with I0HOC/IT9 on 1296: two hours of conversation with steady signals of S9+40 dB, full scale! Nicola then tries FM: S9+40 again!

Too many bureaucratic difficulties in Morocco, so I0SNY and his friends leave for Perugia, the nice, historical, small city where he lives, in central Italy.

Boys, let's see what he will do next summer!

### ITALIAN CALL AREAS

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| I1, IK1, IW1* | Liguria and Piemonte (N.W. Italy) |
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| IN3, IW3 | Trentino Alto Adige (N.E. Italy) |
| IV3, IW3 | Friuli Venezia Giulia (N.E. Italy) |
| I4, IK4, IW4 | Emilia (N. Italy) |
| I5, IK5, IW5 | Toscana (C. Italy) |
| I6, IK6, IW6 | Marche and Abruzzi (C.E. Italy) |
| I7, IK7, IW7 | Puglia (S.E. Italy) |
| I8, IK8, IW8 | Molise (S.E. Italy) |
| I8, IK8, IW8 | Basilicata, Calabria, Campania (S. Italy) |
| IT9, IW9 | Sicily (S. Italy) |
| I0, IK0, IW0 | Lazio (C.W. Italy) |
| I0, IK0, IW0 | Umbria (C. Italy) |
| IS0, IW0U | Sardinia (W. Italy) |

* The IW prefix is for special no-code license, 144 MHz and up.

### ITALIAN ISLANDS AWARD (IIA)

The Italian Islands Award is issued by ARI (Associazione Radioamatori Italiani) to all radio amateurs and SWLs worldwide. The award can be obtained on the following frequencies and with the follow-

### ITALIAN ISLANDS AWARD

List of the islands and points. (To save space, only the points achieved on the HF bands are indicated. There is a different point scale for the contacts on other bands (VHF, UHF, up 3 GHz). The complete point table can be requested from the ARI Award Manager with an SASE.

| | |
|---|---|
| **Isole Liguri—IA4** | |
| Palmaria | 2 |
| Tino | 3 |
| Tinetto | 4 |
| Gallinara | 3 |
| Bergeggi | 2 |
| **Arcipelago Ponziano—IB0** | |
| Ponza | 1 |
| Gavi | 2 |
| Botte | 5 |
| Cappello | 5 |
| Formiche | 5 |
| Le Galere | 5 |
| Mezzogiorno | 5 |
| Palmarola | 3 |
| Piatti | 5 |
| S. Stefano | 2 |
| Ventotene | 1 |
| Zannone | 2 |
| **Arcipelago Napoletano—IC8** | |
| Ischia | 1 |
| Procida | 1 |
| Li Galli | 4 |
| Nisida | 4 |
| Vivara | 1 |
| Capri | 1 |
| **Isola di Ustica—IE9** | |
| Ustica | 1 |
| Banco Apello | 2 |
| Colombara | 2 |
| Medico | 2 |
| **Isole Pelagie—IG9** | |
| Lampedusa | 2 |
| Lampione | 3 |
| Linosa | 3 |
| Isola Conigli | 5 |
| **Isola di Pantelleria—IH9** | |
| Pantelleria | 1 |
| **Arcipelago Toscano—IA5** | |
| Elba | 1 |
| Corbella | 2 |
| Gemini | 2 |
| Meloria | 2 |
| Ogliera | 2 |
| Ortano | 2 |
| Palmarola | 1 |
| Ramaiolo | 2 |
| Scoglietto | 2 |
| Sedia Paolina | 2 |
| Scoglio Africa | 3 |
| Topi | 2 |
| Triglia | 2 |
| Gorgona | 1 |
| Montecristo | 3 |
| Pianosa | 2 |
| Cerboli | 2 |
| Falconcino | 2 |
| Santa Lucia | 2 |
| Capraia | 1 |
| Giannutri | 2 |
| Giglio | 1 |
| Argentarola | 3 |
| Formica Burano | 2 |
| Formiche | 2 |
| Isola Rossa | 2 |
| Isolotto | 3 |
| Sparviero | 2 |
| **Arcipelago delle Eolie—ID9** | |
| Lipari | 1 |
| Alicudi | 1 |
| Filicudi | 1 |
| Canna | 5 |
| Montenassari | 3 |
| Panarea | 3 |
| Basiluzzo | 3 |
| Battara | 3 |
| Dattilo | 5 |
| Formiche | 3 |
| Lisca Bianca | 3 |
| Lisca Nera | 3 |
| Panarelli | 3 |
| Spinazzola | 3 |
| Salina | 1 |
| Stromboli | 1 |
| Strombolicchio | 2 |
| Vulcano | 1 |
| **Arcipelago delle Egadi—IF9** | |
| Asinelli | 5 |
| Porcelli | 5 |
| Favignana | 1 |
| Formica | 2 |
| Galeotta | 5 |
| Maraone | 2 |
| Preveto | 5 |
| Levanzo | 1 |
| Marettimo | 1 |
| **Arcipelago Cheradi—IJ7** | |
| San Paolo | 2 |
| San Pietro | 2 |
| **Isole Tremiti—IL7** | |
| San Domino | 1 |
| San Nicola | 1 |
| Caprara | 2 |
| Cretaccio | 2 |
| Pianosa | 4 |
| **Arcipelago della Maddalena—IM0** | |
| Maddalena | 1 |
| Barrettini | 2 |
| Biscie | 2 |
| Budelli | 2 |
| Cana | 4 |
| Caprera | 1 |
| Cavalli | 3 |
| Corcalli | 2 |
| La Presa | 2 |
| Monaci | 2 |
| Piana | 2 |
| Porraggia | 2 |
| Porco | 2 |
| Ratino | 2 |
| Razzoli | 2 |
| Santa Maria | 2 |
| Santo Stefano | 2 |
| Spargi | 2 |
| Spargiotto | 4 |
| Asinara | 2 |
| Cappuccini | 4 |
| Della Bocca | 4 |
| Figarolo | 4 |
| Foradada | 4 |
| Delli Nibani | 4 |
| Poveri | 4 |
| Isolotto Rossa | 4 |
| Le Camere | 4 |
| Le Soffi | 4 |
| Maddalena Alghero | 4 |
| Marmorata | 4 |
| Molara | 2 |
| Molarotto | 5 |
| Mortorio | 5 |
| Mortoriotto | 5 |
| Pagliosa | 4 |
| Pecora | 4 |
| Pedrami | 4 |
| Piana di Alghero | 4 |
| Porri | 4 |
| Proratola | 4 |
| Rossa | 4 |
| Rossa di Bosa | 4 |
| Ruja | 4 |
| Scoglio Businco | 5 |
| Corona Niedda | 5 |
| Scoglio Forani | 5 |
| Scoglio Paganetto | 5 |
| Tavolara | 2 |
| **Arcipelago Cagliari—IM0** | |
| Cavoli | 4 |
| Corno | 4 |
| Il Toro | 2 |
| La Vacca | 2 |
| Mal di Ventre | 2 |
| Meli | 4 |
| Ogliastra | 4 |
| Piana S. Pietro | 4 |
| Quirra | 4 |
| Ratti | 4 |
| Rossa Teulada | 4 |
| San Macario | 4 |
| San Pietro | 1 |
| Sant'Antioco | 1 |
| Serpentara | 4 |
| Tuaredda | 4 |
| Variglioni | 4 |
| **Isole di Oristano—IM0** | |
| Scoglio La Ghinghetta | 5 |
| Scoglio Mangiabarche | 5 |
| Scoglio Pan di Zucchero | 5 |
| **Sardegna—IS0** | 1 |
| **Sicily—IT9** | 1 |
| **Minor Islands** | |
| Prefix I3 | 1 |
| Prefix IV3 | 1 |
| Prefix I7 | 3 |
| Prefix I8 (Sicilian) | 1 |
| Prefix IT9 | 4 |

ing modes: Frequencies: HF, VHF, UHF, microwaves above 3 GHz. Modes: SSB, CW, mixed, RTTY.

To obtain the award, the amateurs/SWLs must work/hear Italian islands to obtain the following score: DX—10 points; EU—20 points; Italy—40 points.

Contacts are valid starting from January 1, 1970.

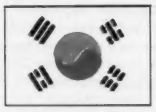
Points must be calculated following the list (see box). Different islands of the same archipelago can be contacted, and the points achieved added up. The same island of the same archipelago can be worked on different bands and modes, i.e., five different contacts with the same island but on five different bands count 5 × points assigned to that island.

*Honor Roll*—This endorsement is achieved with a minimum of 60 points.

*5BIIA*—To obtain this award, 10 contacts must be made with islands or groups of islands on 5 HF bands.

The IIA must be requested from the ARI Award Manager, Via Scarlatti 31, 20124 Milano, Italy. It is not necessary to send QSL cards; a list log-formed is sufficient. The QSL cards must be in the possession of the applicant and should be sent if requested by the Award Manager.

Fee: Any application must be sent with US $8.00 or 30 IRCs.



## KOREA

*J. Michael Wengert HL9KT*
*c/o ABC News*
*CPO Box 2961*
*Seoul*
*Korea*

Amateur radio operators in Korea were surprised recently to receive letters from the "Korean Radio Operators Association," a group of professional radio operators, requesting them to mail fees to the organization and to make their stations available for inspection. Apparently, the Korean Ministry of Communications (MOC), which is responsible for issuance of all commercial and amateur radio licenses and for inspection of all classes of radio transmitting stations, has decided that the annual inspection required for all amateur stations for license renewal will be conducted by the professional organization and not by KARL (Korean Amateur Radio League). KARL had all but announced that they would soon be taking over inspection of amateur stations from the MOC. The reason for turning over the inspection responsibility to an outside organization was given as the "excessive workload" imposed by the growing number of new ham stations in Korea.

This decision from the MOC was yet another blow to KARL, which already was smarting from suspicion and criticism from its members following a procurement scandal. Early this year, a general-affairs director of KARL was relieved of his official duties when it was learned that his position was used to gain exclusive import rights for Japanese-made transceivers for a certain Korean import company whose president was a close friend of the KARL president, National Assemblyman Lee Min Sup. Lee was not directly implicated in the matter, but the incident has yet to be resolved to the satisfaction of KARL members as Lee repeatedly overruled attempts by individual members to bring up the matter for discussion at the KARL annual meeting last April.

Other matters for which KARL is under attack by its members include high fees charged for membership compared to that of other countries. Membership in the League is compulsory for all amateur radio operators in Korea and annual dues must be paid up in advance (US$30) before the KARL president's seal may be applied to applications for annual renewal of the station licenses. The annual inspection fee comes to another $22 (average). This, coupled with high customs duty and local taxes, makes amateur radio in Korea a pastime for rich people.

Attempts by KARL to get mobile/portable operation reinstated have failed. A League source, who prefers to remain anonymous, blames Korea's security agencies for blocking the approval.

Although the total number of amateurs in Korea is on the increase, the number of active hams, especially on the HF bands, is not increasing proportionately. Korea has a Radiotelephone Class license (no-code Novice) which permits phone operation on 80, 40, 15, and 10 meters plus VHF and is relatively easy to get. As a result, many Koreans soon lose interest, sell their rigs, and buy microcomputers, a phenomenon observed in neighboring Japan which also has a box-top, no-code license.

HL9 operation by United Nations Command-affiliated personnel continues, but attempts to get on the new Phase III bird are thwarted by the unavailability of 430 MHz. More on the HL9s and the American Radio Club in Korea next month. 73 from the Land of the Morning Calm.

## LIBERIA

*Brother "Don" Donard, Steffes, C.S.C.*
*EL2AL/WB8HFY*
*Brothers of the Holy Cross*
*St. Patrick High School*
*Monrovia*
*Republic of Liberia*

What is a developing country—in amateur radio?

This question is under consideration by a committee of the Region I Division Conference of The International Amateur Radio Union. When this question has been decided, they will study a proposal "To establish a means of funding, and guidelines for effective operation for the Promotion of Amateur Radio in the Developing Countries."

Here is another quote: ". . . for example, in Liberia there are 67 licensed amateurs of which 26 are members of the Liberian Radio Amateur Association (LRAA). Of the 67, only 10 are indigenous Liberians."

Here in Monrovia, we have just finished a course in amateur radio. Out of a hundred and twenty students who registered for the course, twenty-six came in to sit for the examination. Of these, four passed the General test and four passed the Novice test.

We are a developing country. There is no lack of interest, and the data given above is enough evidence of that. The data given above might also be an indication of the handicaps under which we and the students must work. It takes a lot of courage for a high school student or an adult to study amateur radio without a textbook or a code oscillator.

We are very much encouraged by the fact that the Region I Conference is aware of our problems and is actively engaged in an effort to solve them. They propose to set up a resource center that will make available all kinds of instructional materials. They will stock printed materials that are either donated or that are obtainable free of charge and will appropriate an ongoing fund to purchase instructional materials and to pay shipping charges. They are even exploring the possibility of providing instructors if they are not otherwise available.

This is an ambitious idea but it can work, and if it is handled in the manner in which amateurs traditionally handle their undertakings, it will indeed do what it is supposed to do. It will succeed.

One can only guess what is happening in other developing countries, but here in Liberia there is real promise of progress. We have, at the present time, five places, all of them school locations run by missionaries, where there is one (in some cases more) dedicated person ready to conduct classes in amateur radio even under existing conditions. If we can apply to the Region I committee, or to anyone else for that matter, for essential teaching materials, it would increase very much the effectiveness of our work.

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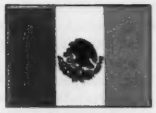

## MEXICO

*Mark K. Toutjian XE1MKT*
*Apartado Postal 42-048*
*06470 Mexico, D.F.*

### MEXICO'S NATIONAL EMERGENCY NETWORK

One of the many activities that has been developed over the years here in Mexico, as in many countries, is the cooperation among many ham radio operators during catastrophes, natural disasters, and airplane accidents, as well as work on problems with mobiles (auto and maritime). In 1943, a communications net known by the name of The Emergency Chain of Ham Radio Operators of the Southeast was established in order to provide auxiliary services along the coast of the Gulf of Mexico, principally in the State of Veracruz. It was formally accepted in 1949 due to the aid of many national hams.

Later on, in 1960, a group of ham operators who were members of the Mexican Radio Experimenters League undertook the labor of forming a nationwide emergency network that would also be tied in with emergency networks in other countries. Frequencies were then established (see box for current frequencies being used). This National Emergency Network was fully organized finally by 1963. One of today's most leading authorities or representatives of the network is Pablo A. Mooser XE1SR who serves as president of the Mexican Radio Experimenters League at the present.

#### Organizational Structure

In order for this National Emergency Network to function well, it is obvious that an administrative staff is very necessary (see box). This is composed of its director and six additional positions in order to coordinate things fully. Under this administrative staff, the country is divided into eight different regions or zones, each with its own Regional Coordinator. Within each region or zone there are various states, each with its own State Coordinator. These coordinators have in mind the development of special programs for members of the net so as to be able to function efficiently under most emergency situations. (This is very similar to emergency networks in other countries.) The structure may be of use to some of you who plan on organizing an emergency network in your own country where ham activities are starting to boom.

#### Certificates Available from the Network

Mexico's National Emergency Network

encourages new membership and more cooperation by means of authorizing three different certificates yearly. This is done by calculating individual attendance figures during each year. First, one has to be a member of the net. This organized transmission takes place daily at 2100 GMT on 3.690 MHz and on the 2nd and 4th Sundays of each month at 1000 GMT on 7.060 MHz. (The frequency chart shows frequencies to use when disaster strikes; they are used frequently for get-togethers.)

1) The first certificate is available for having attended 50 sessions with the net during the year (once a week).

2) The second certificate is available for having attended 150 times during the year (three times a week).

3) The third and last certificate is available for having been on frequency and reported your call 300 times during one year (six times a week).

The National Emergency Network can and has already presented different members with special certificates upon having participated in and resulting in outstanding performances during emergencies, catastrophes, or in special situations requiring aid.

You are possibly asking yourself: "How can I be a member?"

**Membership**

In order to become a member, you must have attended at least 24 sessions of the net during a year (at least once every two weeks). This certificate is valid for one year and is renewable upon attending another 24 sessions as mentioned above.

As was mentioned, many activities are planned by the National Emergency Net each year, and here I could mention that the different radio clubs throughout the country work in harmony with the net and also plan special events such as DXpeditions and other activities for the advancement of ham technology.

**Special Note to Regional and State Coordinators in Mexico**

Upon planning your future activities, I would appreciate it very much if you would send me an outline of such events and other pertinent information that may be of interest to *73* readers! Gracias!

## THE NETHERLANDS

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*2111 GR Aerdenhout*
*The Netherlands*

**FIFTEENTH DNAT**

From the 26th to the 28th of August of this year, the DNAT was held. The DNAT means Deutsch-Niederlandische Amateurfunktage (the German-Dutch Amateur Radio Days).

These days are organized by two Dutch amateur radio unions and one German, namely the VERON, the VRZA, and the DARC.

This annual Dutch-German meeting was held this year for the 15th time, in the beautiful city of Bad Bentheim, which is located near Almelo (The Netherlands), just a few kilometers over the Dutch border in Germany. Every year the Dutch and German hams and their families come from miles around to meet one another in Bentheim.

This year also the DNAT was a great success and hundreds of hams were present. Also yours truly was there with his YL to see what was on the program this year.

*The flea market at Bad Bentheim.*

My first pleasure was to fill up the tank of my car with much cheaper German gas. The difference is about thirty cents a liter! My second pleasure was to find a good camping spot near Bentheim. The thought of taking a hotel during these days you can forget, because all the hotels are fully booked. Anyway, I was glad that I took my tent along because we had extremely high temperatures for our kind of climate and for this time of the year.

We arrived at Bentheim on Friday evening, and because I was a bit tired of my work and I have to drive from the west side of my country to the east side, we had a few drinks and went to sleep.

The next morning my YL, friends, and I checked in at the DNAT office, located in the DARC (German Amateur Radio Club) building. We paid our registration fee and received badges with the DNAT sign. By paying the fee, entrance to all activities was free. We even had free entrance to the Bentheimer Casino and we could visit the Amateur Radio Museum. We also drove out of town and went to the castle of Bentheim. Afterwards we had a look at the flea market; you never know what bargains might be found.

So we took a very close look at all the stands. The place was so crowded that I and my friends kept in contact via our HTs—otherwise we would have lost each other. Since we all came in one car, the thought of losing one other was not a pleasant idea!

There was much to see, from pieces of junk to complete HF lines with reasonable pricetags. I bought some spare tubes for some receivers; the price of one tube was one mark. What can you buy for one mark these days?

After the flea market full of "sonderangebot," as the Germans call it, we had a look in the large school building where a number of German dealers had their stands. All the big names in ham equipment were present, and often these dealers had special DNAT prices. We bought some antenna stuff.

In the evening we went to a large hamfest in the garden of the castle of Bentheim, where we could dance to the music of a combo. On Sunday morning we packed up our things and went home again. It all was a great success, and I promised myself and my YL that we'll be there again next year.

**NEW RULE**

A new rule in Dutch amateur radio license conditions requires that all hams make a complete inventory of all the transmitters they own. This list has to be in the station's logbook and must include serial numbers, date of selling or purchase, type of equipment, power output, and name and address from whom the rig was bought and to whom the rig was sold. So, in the future, all Dutch hams will need an accountant to keep papers in order. (Hi).

## NEW ZEALAND

*Des Chapman ZL2VR*
*459 Kennedy Road*
*Napier*
*New Zealand*

This month I shall explain about the birth of the Amateur Radio Emergency Corps of the New Zealand Association of Radio Transmitters.

**THE 1931 EARTHQUAKE**

"There can be, at this time, no more topical or important subject than the calamitous earthquake that has almost razed to the ground the towns of Napier and Hastings. The day of February 3rd, 1931, will remain for long a day of grief and consternation for the country as a whole, even as for years the date '79 A.D.' was significant for the annihilation of the cities of Herculaneum and Pompeii by Vesuvius."

So went the editorial from *Break-In* for the month of February, 1931. It goes on to extol the feats of two local Hawkes Bay amateur radio enthusiasts from Napier and Hastings who were able to transmit messages to the outside world of the tragedy of that day. ZL2GE (George Tyler) and ZL2BE (Jim Mills) provided the only communications links with places outside the earthquake-affected area in those early few hours after the first shocks at 10:50 that morning.

There were some other radio stations on board ships in the harbor which were able to call for help, too, but the amateur stations were operating from the centers of the two stricken cities. Both stations were battery operated and had contact with other amateur stations. Early in the emergency, the New Zealand Post and Telegraph Department requisitioned the amateur stations at Napier and Hastings as well as an amateur station in Wellington so that there were communications links available for emergency traffic in the first 24 hours after the calamity and until the telegraph and telephone lines were repaired and normal communications were restored.

**THE RADIO EMERGENCY CORPS**

That very briefly indicates the happenings of the 1931 February day when the earthquake struck. As a direct result of the success of the earthquake amateur radio communications network, the New Zealand Association of Radio Transmitters formed the Radio Emergency Corps in March, 1932.

Previously, about 1930, as a result of suggestions at a Headquarters meeting, a form of communications network was set up under the name of the Guard System and introduced in March, 1931. Guard stations were rostered two nights each week to operate a traffic net between HQ and the Branches of NZART. Rosters were published in *Break-In* and the NZART *Journal*, and the Guard System operated from 6:30 pm to 10:00 pm, Monday to Friday, and 6:00 pm to 11:00 pm, Saturday and Sunday.

It was intended that in times of an emergency, all Guard Stations would stand by for the Control Guard Station in the District affected by the emergency and handle any traffic as required. This Guard System gave the members practice in handling messages on the air and established a link between HQ and the Branches. The system was most successful, and many messages were transmitted and received every week on a scheduled basis. However, in due course, the New Zealand Post and Telegraph Department, the regulatory body in New Zealand, decided this message service was contrary to the radio regulations governing the amateur service here (no third-party traffic allowed), so NZART discontinued the Guard System.

About the same time as the Guard System was being formulated, a Christchurch group of amateurs under Norm Laugeson ZL3AS assisted by Hugh Simpson ZL3CF, Jack Elliott ZL3CC, and Les Hurrell ZL3BG had set up a group in that area able to go into action in an emergency at short notice should the necessity arise. But because the Christchurch group was part of the Radio Society of Christchurch and the Third District Transmitters Association, the two clubs catering to the local budding radio enthusists of the 30s, they were not part of the NZART message-handling system, although most of the group were members of the NZART. The Third District RTA in due course merged with the NZART to form the Christchurch Branch.

With the termination of the Guard System, Norm Laugeson, then a Vice-President of NZART, put forward a proposal to HQ for an emergency radio communications scheme, and in February, 1932, the proposal was adopted by the Executive of NZART, and amateur stations were asked to form themselves into local Sections of the Radio Emergency Corps, each self-contained but affiliated to the national body of emergency stations at Headquarters. Thus, the Radio Emergency Corps was formed.

The response from amateurs throughout the country was tremendous. A constitution was produced, and by March, 1932, nine Sections had been formed and a National REC Field Day was held to test the emergency network; 27 amateur stations and approximately 50 operators participated in that first successful Field Day.

The Field Day organization consisted of at least three stations, a Guard Relay Station (Base Station today), a Zone Station (Field Headquarters today), and an Outpost Station (or stations)—the same title today. Stations were to organize and ex-

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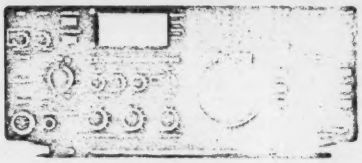

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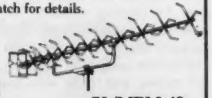

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change messages during the exercise, up and down the network. The Guard Relay Stations handled the messages between each District and distributed the messages for their own District to the Zone Stations, which retransmitted them to the Outpost Stations. Zone and Outpost Stations were operated at a portable location, on battery power.

The pace of the organization of the Radio Emergency Corps continued to quicken, and in June, 1932, negotiations were completed with the New Zealand Post and Telegraph Department for the allocation of special callsigns and wavelengths for the Emergency Service to use during practices and emergencies. As this step had finally cemented the setting up of the REC of NZART, Headquarters, through an editorial in *Break-In*, paid tribute to the untiring efforts of Norm Laugeson ZL3AS and Wally Ashbridge ZL2GP of Wellington, in formulating and founding the REC. Headquarters expressed the gratitude of all ZL amateur operators and the community at large for all the work these two men, and others closely associated with them, had done to set up an organization that was to become well known in the future.

Wally Ashbridge, a professional communications man in the New Zealand Army and the officer in charge of the Guard System, was appointed the first Commanding Officer of the REC. The collaboration between Wally Ashbridge and Norm Laugeson, professionally a detective in the NZ Police, is obvious today when one observes that there is very little difference between the basic organization of the present day emergency network systems and that which they formulated over 50 years ago. Truly a great tribute to the organizational abilities of these two men and their assistants.

The honor of the first operation went to the Christchurch group which went into action in January, 1932, in response to a request from Wally Ashbridge to provide some radio communications for search parties at an alpine tragedy in the Southern Alps. They made ready a group of four Christchurch amateurs, complete with transmitters, receivers, and suitable rations for one week in the field, within one hour of the request being received. They were to set up a communications net between the search parties in the Alps and the Telegraph office at Bealy, the headquarters for the search, some 15 miles distant. Although the missing trampers' bodies were found before the team was able to set up the communications net, it ably demonstrated the way REC was going to work in emergencies.

In July, 1932, the new REC held another Field Day with the newly allotted callsigns and wavelengths. In all, 11 Sections operated with the "E" calls very similar to those we use today, but only two-letter ones for obvious reasons. The present three-letter callsigns were introduced in the early 50s. At this 1932 Field Day, the frequencies used were between 100 and 105 meters, and these were found to be useful but not successful in some areas. The Field Day was a great success, and Wally Ashbridge declared that all Sections were fit to operate on emergency duties any time the need should arise. All Sections agreed that the exercise had been a successful one, but some felt that a frequency change could improve the communications between some of the Basic Stations.

By February, 1933, a new constitution and organization plan was approved by Headquarters and duly circulated to all members. The 1933 format and organization is still basically the same as given in our modernized AREC Manual in use today.

Over the years, the AREC has participated in many searches and rescues, severe floodings on both North and South Islands, air crashes, earthquakes, land subsidances, and marine searches. The Amateur Radio Emergency Corps of today is still the same as our founders intended—to provide emergency communications during times of national calamity or tragedy, and to provide readily organized mobile transmitting and receiving stations, equipment, and operators to function at short notice should they be required—except that the equipment we use today has changed drastically from that used in former times.

Today, when Search and Rescue Headquarters requires it, we are able to put teams into operation with portable and base stations to assist with all manner of emergency and rescue operations, whether it be in the city, the bush, mountainous terrain, or at sea.

In contrast with the 1932 Field Day statistics mentioned previously, and 51 years later, the 1983 Field Day statistics were: 59 Sections operated 266 Field Day stations, manned by 491 operators, on 80, 40, and 2 meters, and sent and received over 12,000 messages during the 6-hour period of the exercise.

### AWARDS

Last month I made mention of a special award to commemorate the 100th birthday of Hastings City. Here are details.

The City of Hastings Centennial Award is open to all amateurs worldwide on all bands and all modes; the period of the award will be from 0001 hours GMT, February 1, 1984, until 2400 hours GMT, February 29, 1984 (*one month only*). Applicants for the award must complete two-way contacts with Hastings stations or members of the Hastings Branch number 13 of NZART as follows: overseas stations—3 contacts, any band, any mode; ZL stations—5 contacts, any band, any mode.

No QSL cards are required; just send a detailed list of the contacts, verified by another amateur operator, to the Awards Manager, PO Box 609, Hastings, New Zealand, with US$2.00 or IRC equivalent, to receive the handsome colored certificate.

Hastings is a city of about 50,000 population situated in the province of Hawkes Bay on the east coast of New Zealand's North Island. The area is favored with a good climate and is surrounded by some of the most fertile land in the country. Hastings is the center of a great and expanding food- and meat-processing industry and one of the most prolific fruit- and grape-growing districts in New Zealand; it justly earns the name, "The Fruit Bowl of New Zealand."

Hastings was constituted a town district in 1833, and in 1886 achieved borough status. The earthquake of 1931, followed by raging fires, caused great loss of life and reduced the town to ruins. The manner in which the city was rebuilt is a tribute to the citizens of that day. In 1956, the borough was proclaimed a city. The motto on the City Arms signifies the harmony between city and countryside.

So to all certificate hunters and readers of *73*, best of luck with this special award. Remember, it is available only for contacts during the month of February, 1984.

By my calculations, this column should be appearing in the January issue of *73*, so I take this opportunity of wishing all readers belated Christmas greetings and the very best of luck for the coming year. For those of you in the northern hemisphere, you are in the depth of your winter season at this festive time while we, down under, are enjoying mid-summer temperatures and our summer holidays, as well as the festive season.

In New Zealand, most large manufacturing businesses curtail their operations at Christmas time, closing from about December 23rd until around January 15th, except for maintenance staff, so we here all have our summer holidays at that time. The schools close for their summer vacation about December 15th and do not resume until February 1st, the equivalent of the US/Canadian July/August school holiday closing.

I hope everyone had a Happy Christmas and a joyous New Year and that Father Christmas brought you something worthwhile for the shack this year!

## PAPUA NEW GUINEA

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*Rabaul*
*Papua New Guinea*

Lae is the capital of the Morobe Province, one of the twenty provinces of Papua New Guinea. The Morobe Province is located in the northeastern part of New Guinea. Lae, the administrative center of the province and also the industrial metropolis of the entire country, is situated on the Huon Gulf. It is the gateway to the Markham Valley. The population of Lae is approximately 65,000. In Lae we have the country's foremost technological institution: the Papua New Guinea University of Technology, commonly known as Unitech.

The amateur population of Lae is seven, four of whom are on the staff of Unitech (three in the Electrical Engineering Department). P29BR, P29LC, P29MC, and P29NL are Unitech staff. Husband and wife team P29JH and P29NWJ, John and Betty, are with the P and T Training College and are active from Lae. George P29NCB makes up the seventh member of Lae's amateur population; all are expatriates.

Unitech attracts students from all provinces of Papua New Guinea—indeed, from a number of South Pacific countries. What better forum for promoting and advertising amateur radio and thus increasing the number of PNG nationals who are amateurs? In November, 1982, P29BR, P29LC, P29MC, and P29NL put their heads together and decided to offer radio amateur classes to interested students. To publicize amateur radio, a lunch-time demonstration was organized with P29BR bringing his rig along and demonstrating it. The exercise also was written up in the campus newspaper, the *Reporter*. The response was tremendous, and more than 100 students enrolled for amateur radio classes. Thus the Unitech Amateur Radio Club (UARC) was formed and it has the callsign P29HT. The club is affiliated with the Papua New Guinea Amateur Radio Society.

P29BR, P29LC, P29MC, and P29NL give freely of their spare time and provide three hours of tuition per week in CW, theory, and regulations. Practical projects, such as building Morse-code oscillators, are included. P29BR records CW tapes for the weekly classes and on one occasion he decided to take the prepared tapes home. The following morning Bill discovered that his house had been burgled during the night but that the only things missing were the plastic bag containing the tapes, a pair of jeans, and a packet of cheese. A very selective thief, and one who will be bewildered by the strange sounds on the tapes!

The turnover of young hopefuls in the amateur radio classes is large; not many have the staying power, but generally 20 students attend and it is hoped that a number of those will attempt the Novice examinations the next time they are given.

Last year, Bill P29BR went on a visit to the United States and while there approached the ARRL regarding the possibility of donations of equipment and/or publications to help the students at the Unitech Amateur Radio Club; the oral response was positive. Bill also visited the Asia Foundation, and the Area Director for the Pacific Islands there offered assistance with postage expenses for sending material. An official reply was subsequently received from the ARRL which expresses unwillingness to deal directly with the Unitech Amateur Radio Club and appeared willing to have donations handled only through the Papua New Guinea Amateur Radio Society. There can be no questioning the ability of the staff and their supervision at the Unitech Amateur Radio Club. There also cannot be any doubt that future PNG amateurs are more likely to come from Unitech than anywhere else in the country. Why then this reluctance on the part of the ARRL to deal with UARC directly?

It is hoped that several of the students will be successful in the next Novice exams and that a number of PNG nationals will be on the air after that. Another consideration is the application fee which has to be paid six weeks prior to the exam. In the event of any students finding the fee beyond their means, the UARC is willing to come to the rescue out of club funds. We wish the UARC every success in their undertaking!

On July 14, 1983, the Post and Telecommunication Corporation in PNG sent out letters to all amateur radio station licensees introducing the new frequencies available as from that date. Full-call operators have the authorization to operate on all the new frequency bands. Limited amateur radio stations are permitted to operate on all new frequency bands above 30 MHz, and for Novice amateur radio stations there is no change in operating frequencies.

## POLAND

*Jerzy Szymczak*
*78-200 Bialogard*
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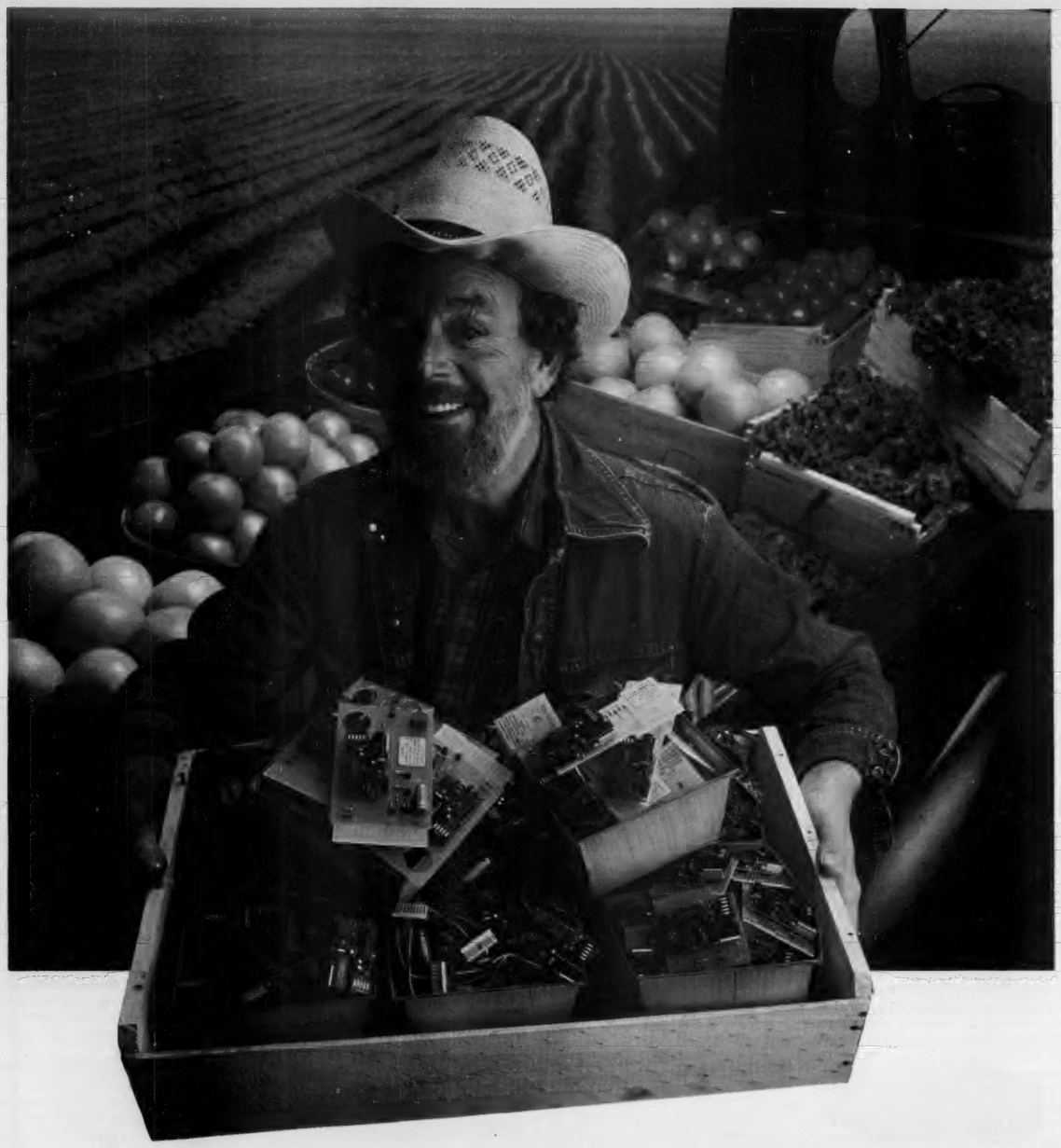
*Poland*

### POLISH ETHER CARRIES SOUND AGAIN

On January 1, 1983, martial law in Poland was suspended. Polish hams expected to begin their usual activity. But no gain without pain. Renewing licenses was faced with official difficulties, and the commencement of reissuing them did not take place in January as it had been announced.

At the beginning of 1983, letters of application—printed forms submitted by petitioners to District Verification Boards—were still being brought up to date. At the end of January, 1250 applications were confirmed, and on April 1 over 1700. The Presidium of PRAA (Polish Radio Amateurs Association) was informed that



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licenses of club radio stations would be handed over to them in April and those of individual radio stations at the turn of the second and third quarters of this year. Better late than never.

Negotiations with authorities brought changes of these provisions. For the sake of the annual international competition, the SP DX Contest, it was promised that licenses would be delivered in March, 1983. And really, 460 individual and 70 club licenses were given. Well, it's a long lane that has no turning. Poles are in the ether again.

A problem is how well this process will continue. At the sixth PRAA director's meeting last April, the president of the association urged patience and calm but encouraged hams to continue to press for more action, through regular channels. He predicted that radio amateur activity would reach a normal level in a few months.

The president has also expressed regret at the new limitations placed on Polish hams and for the State Radio Surveillance.

It was hoped that by the end of 1983, the action of bringing licenses up to date would have been completed. How many Polish hams will be able to use their calls in 1984 when the National Congress of PRAA takes place, nobody knows. But some of them are presently in the ether, so enter upon a conversation with them!

## SWEDEN

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### SVALBARD EXPEDITION

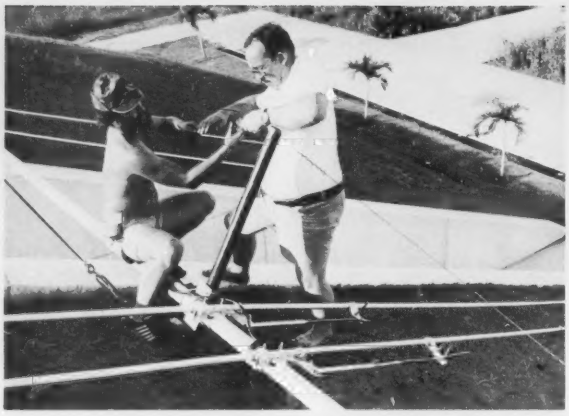
A Swedish group of four made a second expedition in the summer of 1983 to the Svalbard Islands in the Arctic Ocean. The group members do this entirely of personal interest on their own vacation time. Two members of the group were ham operators, Kjell SM2AZH and Sigvard SM2EJE.

The purpose of this expedition was to study the flora and fossils. Svalbard has an interesting history and has a geological structure of scientific importance. From the ham-radio point of view, the first trip in 1982 was no success. The radio equipment got damaged by water during transportation between islands in high winds.

The islands of Svalbard (prefix JW) belong to Norway. They are about 1,100 kilometers (700 miles) from the North Pole. The summer temperature reaches refrigerator level. The islands have no permanent residents, but boats stop there when the harbors are free of ice. Svalbard has been the base for many Arctic expeditions. The Norwegians began mining coal there in the 1890s.

Kjell and Sigvard were active from Svalbard using their home calls /JW between July 20 and August 4, 1983. In case you were lucky enough to work them, use their *Callbook* addresses for the QSL.

The equipment for the expedition was sent in advance on a ship for coal transportation. The group itself flew out of Tromsoe (Norway) to their base in Longyearbyen on Svalbard. The radio equipment consisted of a Kenwood TS-120V, the low-power version of this well-known transceiver, and a Heathkit HW-8 for backup. For power, they used two batteries



*Jean HS1ANV/ON8JA (left) and Hans HS1BG secure the supporting truss on the 20/15-meter (full-size) beam. Note the gamma match, using aluminum piping, plastic hose, and an inner core of copper tubing for the driven elements.*

rated at 60 Ah which they charged by a gasoline generator. The antennas for 7 and 14 MHz were verticals, and a dipole was used for 3.5 MHz.

The propagation that far north is very poor on the low bands during the summer season. This is due to two months of daylight and sunshine 24 hours a day. They managed to contact northern Norway and northern Sweden on 40 meters, however, although 20 meters was the best band. A few good openings towards the US and South America stirred up some pileups. Anyway, hamming was not the main purpose for this expedition, so the QSO rate was low. Because of the frequent change of location and transport between islands in a rubber boat, operating time was limited. But wherever hams go and for whatever reason, they surely bring ham radio with them. Kjell and Sigvard and the two other members of this expedition must have had a unique vacation to remember!

### NRAU MEETING IN STOCKHOLM

The Nordic Radio Amateur Union was formed in 1935 with the purpose of working for common Nordic interests for the radio amateurs. Through the NRAU there is a valuable dialogue between the leagues in the Nordic countries. Meetings are held annually. The next one is taking place in Stockholm on January 14-15, 1984. The NRAU runs a very low-budget operation, and to make it possible for representatives from distant Iceland (TF) and Faroe Islands (OY) to attend, the other larger leagues try to sponsor them.

Contributions from the Nordic Council, an organization founded in 1952 by the Nordic parliaments for improvement for Nordic cooperation, have been applied for. Unfortunately, no financial support has been received in previous years. Let us hope that they are more obliging this time.

One major subject for discussion at the NRAU meeting is the common Nordic license. This has been worked on for years, but still only regular reciprocal rules apply. Crossing borders between Nordic countries does not require a passport, and you have to be observant even to see the customs house, but still do not even bring the 2-meter hand-held over the border unless you have a valid guest license. Hopefully, this situation will be solved eventually so that it will be as easy to operate from different Nordic countries as it is between the USA and Canada.

*The antenna is nearly ready for the HSØHS Seanet-contest operation.*

## THAILAND

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*Thailand*

Most countries have their national radio society, and in Thailand the "magic" acronym is RAST, standing for the Radio Amateur Society of Thailand, which has been representing amateur radio activity in Thailand since its founding in November, 1963.

In addition to holding regular club meetings on the first Sunday of each month, to which all visiting radio amateurs are heartily welcomed, it has organized many other activities and has represented Thailand in the field of amateur radio on numerous occasions.

Highlights have been the Southeast Asia Network conventions in 1977 and again last year. Also, club representatives have endeavored to attend every major international conference on amateur radio, such as the World Administrative Radio Conference held in Geneva, IARU regional meetings such as the Manila conference in April, 1982, and the World Communications Year conference in Tokyo in September, and the World Amateur Radio International Conference.

Club meetings regularly vote on routine IARU motions, and full international representation is maintained through the club secretary. The address for all correspondence (as well as for the QSL bureau) is PO Box 2008, GPO, Bangkok 10501, Thailand.

A most encouraging aspect of amateur radio in Thailand has been the recent upsurge in interest among Thais in the hobby and its related aspects. Up until 1971, which coincided with the American presence in Vietnam, the society regulated membership to a maximum of 50. This was largely so that it could be in a posi-

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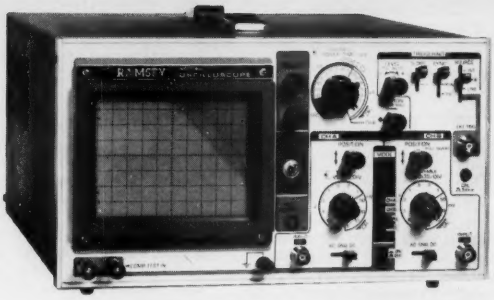

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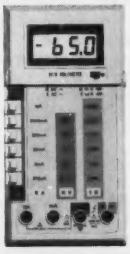

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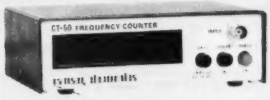

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tion to control the activities of what was at that time a hobby mostly pursued by American servicemen based temporarily in Thailand. But with the gradual withdrawal of American forces, the complexion of the club began to change. More Thais joined, and now the society has about 600 registered members, of which 90 percent are Thai—a far cry from the late 1960s when the hobby had caught the imagination of few Thais.

This upsurge can be attributed to several factors, not the least being enthusiasm shown by the Post and Telegraph Department and personally by the department's director-general, Police Major-General Suchart P. Sakhol, who addressed one very-well-attended RAST meeting in 1981.

It would also be appropriate to credit the society's former president, the late Brigadier-General Kamchai Chotikul HS1WR, for his lifelong dedication to the hobby. He also did much to popularize amateur radio and to increase club membership. All club members, as well as his many friends in amateur radio circles, were deeply saddened at his death in June, 1982.

The society has, of course, continued on its course of promoting the hobby and doing its best to popularize amateur radio and its self-educational aspect in this era of rapid technological advances, especially in the field of communications. As an example of this, the club has embarked on a course of teaching computer applications in amateur radio, since the integration of microcomputing and amateur radio is inevitable and they are compatible.

The society also has conducted other educational courses, including Morse code, and especially in teaching the electronic principles and operating procedures required for the Thai equivalent of a Technician's license for two-meter operation.

The Thai PTT has shown great enthusiasm for amateur radio, especially in the light of constraints relating to national security apparently imposed from outside the Communications Ministry. The department has also shown cooperation in authorizing special-event stations on the HF amateur bands for such occasions as major contests and for the Southeast Asia Network Convention in November, 1982.

RAST was thus able to operate an HF station for the Seanet contest in August this year as well as to take part in the All Asia DX Contest (CW section) that same month. Arrangements also were made for the CQ WW phone and CW contests in October and November.

In operating these contests, the club was most grateful to the Asian Institute of Technology on the outskirts of Bangkok which has endorsed our applications to operate on campus and which kindly offered the use of its premises for these club events. In this way, experienced amateur radio operators have been able to demonstrate several aspects of the hobby to those without firsthand experience.

For example, for both contests, club members constructed their own full-sized yagi beam antennas for the 10-, 15,- and 20-meter bands using entirely locally-available aluminum piping and other hardware. The antennas were up and in the air and getting 5 and 9 plus reports all within the space of two afternoons of work by a team of five hams: HS1AHT, who supervised the project, and HS1ALP, HS1BG, HS1ANV, and HS1AMH (yours truly).

The club also issues a much-coveted award, the Siam Award. This is granted to amateur radio stations and SWLs who have submitted evidence (endorsed log extracts) of contacts with Thai amateur radio stations in at least six of the nine call areas as well as the HS0 prefix which signifies a special-event operation. Alternatively, evidence of contacts with 10 different HS stations also qualifies for the award. Applicants should enclose US$5.00 or the equivalent in IRCs to cover the return postage of the award.

The situation regarding operating on HF on a routine basis has not changed since my September, 1983, column, but those who are looking for Zone 26 or Thailand on 10, 15, 20, 40, or 80 meters should listen for a pileup for the call HS0HS, the special-event station, during a major contest.

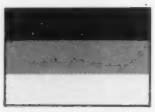
| Qualified for license Class | Test for technical knowledge | Test for operating knowledge | Test on regulations | Morse Code send and receive (wpm) |
|---|---|---|---|---|
| B | 75 | 65 | 65 | 12 |
| A | 65 | 65 | 65 | 6 |
| C | 50 | 65 | 65 | N/A |
| Upgrade from A to B | 75 | – | – | 12 |
| Upgrade from C to A | 65 | – | – | 6 |
| Upgrade from C to B | 75 | – | – | 12 |

*Table 1. Percent-correct and wpm scores needed to qualify for licenses, by class and subjects.*

| Class | Number | PC of Total | PC Increase 1982–1983 |
|---|---|---|---|
| B | 26,944 | 56.1 | 5.1 |
| C | 20,254 | 42.2 | 1.6(!) |
| A | 822 | 1.7 | 37.0 |
| Total | 48,020 | | 4.0 |

Note: The A license has been in existence for only 2 years, and the major reason for the low increase in class C licenses has been due to license holders upgrading to higher license classes. Also note a bad sign: The *total* increase of 4 percent was down over the previous year's increase of 6.6 percent.

*Table 2. Distribution of total number of licenses, by class, and percent increases.*



## WEST GERMANY

*Mitchell B. Wolfson DJ0QN*
*Furtweg 18d*
*D-8044 Lohhof*
*Federal Republic of Germany*

With the hullabaloo concerning the FCC proposal for a code-free license, I felt that it would be appropriate to illustrate how such a license has been approached here in Germany. Before going into the code-free license specifically, let's get a general overview into the German licensing structure first.

There are only three license classes in Germany, A, B, and C. The B license is your all-purpose ticket, giving you full privileges on all bands with a maximum peak power of 750 Watts on 80 meters through 1.2 GHz, and with reduced power on 160 meters, the WARC bands, and the UHF bands 2.3 GHz and above.

The A license is similar to the present Technician-class license in the States, with full VHF/UHF privileges, and with CW from 3520–3600 and 21090–21150, plus full 10-meter phone privileges. Maximum peak power is 150 Watts for bands up to 1.2 GHz. This class of license can be recognized by callsigns beginning with DH.

The third class of license is the class C, the code-free license. This class of license carries all VHF/UHF privileges from 2 meters and up, with a maximum peak power of 75 Watts.

As for the exam itself, the biggest surprise is that there is actually only one exam for all three license classes! The difference between the three license classes lies in the score received on the exam, combined with the code speed tested. It is quite possible for an applicant for a class C license to pass the exam with a score qualifying him for a B license, with only the CW exam lacking. Judging by the number of technically-inclined individuals with class C licenses, I would assume that this situation occurs quite often.

Table 1 illustrates the four parts of the German amateur-radio examination along with the score (in percent) needed to qualify the applicant for a specific license class. Note that the class C license requires the applicant to score only 50 percent on the technical portion, which certainly makes this license class relatively easy to obtain.

Now come the big questions: What is the split between the three license classes and what is the impact of the class C license?

As of January 1, 1983, there were 48,020 licensed amateurs in the Federal Republic of Germany. The split and increase over January 1, 1982, is shown in Table 2.

Now for a bit of editorializing: I have to admit that I accepted the concept of a code-free license with trepidation. Having operated in the USA for nine years before moving to Germany six years ago, I could not bring myself to accept that the class C operators were anything more than a bunch of lids.

Having now had time to let it sink in, plus having been active in club activities, I have come to think otherwise. When I look around at my fellow club members, I see that a number of truly invaluable people are class C holders. There's the club newsletter editor, the member teaching a Basic course, others interested in building equipment for the club station, etc. Many of the other members are ex-C licensees, such as our club president and the one before him. In looking outside our little group, I also see class C licensees active in repeater groups, writing technical articles for amateur magazines, etc.

When you go up to one of the present or previous class C license holders and ask specifically if they would have bothered to have learned CW to get their licenses, the answer could be a "yes," or "no," or a "maybe," but in general they feel that it would have been an unnecessary hindrance. It really is too difficult to speculate on this point, but I'd hate to think about losing many invaluable fellow amateurs just due to the Morse code.

As for the lids on 2 meters with a California-size amateur population with very few repeaters to operate on, the incidence of turkeys is amazingly low when put into perspective. Remembering what it was like in California makes me appreciate the true professionalism many German class C holders exhibit.

Will it work in the States? In my opinion, only you can make it work. If you will accept a code-free licensee as one of your own and try to understand that he or she may be able to contribute to your club in some way, you will find that the Morse code does not really make one a better person. Quite the contrary, many of the young people now interested in computers or electronics would make great amateurs. Do you really want to have to force them all to learn the code? In Germany, we don't and it works!

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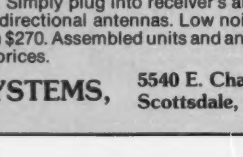


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### Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1 **$8.95**

### Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

### Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 **$2.95**

### Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

### CPO-1

Runs on 3-12 Vdc 1 wall out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

### FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

### Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 **$6.95**

### Tone Decoder

A complete tone decoder on a single PC board. Features 400-5000 Hz adjustable range via 20 turn pot, voltage regulation. 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 **$5.95**

### Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

### Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.

MB-1 Kit **$4.95**

### Siren Kit

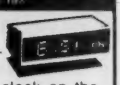
Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker. Complete kit, SM-3 **$2.95**

### 60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma). 1 min. month accuracy. TB-7 Kit **$5.50**
TB-7 Assy **$9.95**

### CLOCK KITS

**Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!**



Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

### SATELLITE TV KIT

THE POPULAR SAT-TEC RECEIVER IN KIT-FORM!

image rejection, fully tunable audio to recover 'hidden' subcarriers, divide by two PLL demodulator for excellent threshold performance, tight tracking AFC to assure drift free reception, and of course, full 24 channel tunable coverage.

Build your satellite TV system around the R2B, close to ten thousand others already have and now it's available in kit form at a new low price. Order yours today.

## NEW, LOWER PRICES!

Featured in a Radio Electronics magazine cover story (May 82), the reliable R2B Sat-tec TV receiver is now operating in thousands of locations. The R2B is easy to build; pre-etched, plated boards with screened component layout assures accurate component placement and the critical IF section and local oscillator are pre-assembled and aligned! All parts are included for the R2B; attractive case, power supply, descriptive operating manual as well as complete assembly instructions. Features of the receiver include: dual conversion design for best

A complete Satellite TV System requires a dish antenna, LNA (low noise amplifier), Receiver and Modulator.

R2B Receiver Kit **$295.00**
R2B Receiver, Wired and Tested **$395.00**
120° K. LNA **$295.00**
RM3 RF Modulator **$49.95**
Prices include domestic UPS shipping and insurance.

## PARTS PARADE

## IC SPECIALS

### LINEAR

| | |
|---|---|
| 301 | $ .35 |
| 324 | $1.50 |
| 380 | $1.50 |
| 555 | $ .45 |
| 556 | $1.00 |
| 565 | $1.00 |
| 566 | $1.00 |
| 567 | $1.25 |
| 741 | 10/$2.00 |
| 1458 | $ .50 |
| 3900 | $ .50 |
| 3914 | $2.95 |
| 8038 | $2.95 |

### CMOS

| | |
|---|---|
| 4011 | .50 |
| 4013 | .50 |
| 4046 | $1.85 |
| 4049 | .50 |
| 4059 | $9.00 |
| 4511 | $2.00 |
| 4518 | $1.35 |
| 5639 | $1.75 |

### TTL

| | |
|---|---|
| 74S00 | $ .40 |
| 7447 | $ .65 |
| 7475 | $ .50 |
| 7490 | $ .50 |
| 74196 | $1.35 |

### SPECIAL

| | |
|---|---|
| 11C90 | $15.00 |
| 10116 | $ 1.25 |
| 7208 | $17.50 |
| 7207A | $ 5.50 |
| 7216D | $21.00 |
| 7107C | $12.50 |
| 5314 | $ 2.95 |
| 5375AB/G | $ 2.95 |
| 7001 | $ 6.50 |

### FERRITE BEADS

With info and specs **15/$1.00**
6 Hole Balun Beads **5/$1.00**

### READOUTS

| | |
|---|---|
| FND 359 .4" C.C. | $1.00 |
| FND 507/510 .5" C.A. | 1.00 |
| MAN 72/HP7730 .33" C.A. | 1.00 |
| HP 7651 .43" C.A. | 2.00 |

### TRANSISTORS

| | |
|---|---|
| 2N3904 NPN C+F | 15/$1.00 |
| 2N3906 PNP C+F | 15/$1.00 |
| 2N4403 PNP C+F | 15/$1.00 |
| 2N4410 NPN C+F | 15/$1.00 |
| 2N4916 FET C+F | 4/$1.00 |
| 2N5401 PNP C+F | 5/$1.00 |
| 2N6028 C+F | 4/$1.00 |
| 2N3771 NPN Silicon | $1.50 |
| 2N5179 UHF NPN | 3/$2.00 |
| Power Tab NPN 40W | 3/$1.00 |
| Power Tab PNP 40W | 3/1.00 |
| MPF 102/2N5484 | $.50 |
| NPN 3904 Type T+R | 50/$2.50 |
| PNP 3906 Type T+R | 50/$2.50 |
| 2N3055 | $.80 |
| 2N2646 UJT | 3/$2.00 |

### Sockets

| | |
|---|---|
| 8 Pin | 10/$2.00 |
| 14 Pin | 10/$2.00 |
| 16 Pin | 10/$2.00 |
| 24 Pin | 4/$2.00 |
| 28 Pin | 4/$2.00 |
| 40 Pin | 3/$2.00 |

### Diodes

| | |
|---|---|
| 5.1 V Zener | 20/$1.00 |
| 1N914 Type | 50/$1.00 |
| 1KV 2Amp | 8/$1.00 |
| 100V 1Amp | 15/$1.00 |

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

### Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ½" center, ½" leads, bag of 300 or more. **$1.50**

### Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

### Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc. 5 for $1.00

### Mini 8 ohm Speaker

Approx. 2"-4" diam. Round type for radios, mike etc. **3 for $2.00**

### Slug Tuned Coils

Small 3/16" Hex. Slugs turned coil. 3 turns. 10 for $1.00

### Crystals

| | |
|---|---|
| 3.579545 MHZ | $1.50 |
| 10.00000 MHZ | $5.00 |
| 5.248800 MHZ | $5.00 |

### AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end.

| | |
|---|---|
| 8.5 vdc @ 20 mA | $1.00 |
| 16 vac @ 160mA | $2.50 |
| 12 vac @ 250mA | $3.00 |

### Solid State Buzzers

small buzzer 450 Hz. 86 dB sound output on 5-12 vdc at 10-30 mA. TTL compatible **$1.50**

### AC Outlet

Panel Mount with Leads **4/$1.00**

### CAPACITORS

| TANTALUM Dipped Epoxy | | ALUMINUM Electrolytic | | DISK CERAMIC | |
|---|---|---|---|---|---|
| 1.5 uF 25V | 3/$1.00 | 1000 uF 16V Radial | $.50 | 01 16V disk | 20/$1.00 |
| 1.8 uF 25V | 3/$1.00 | 500 uF 20V Axial | $.50 | 001 16V | 20/$1.00 |
| .22 uF 25V | 3/$1.00 | 150 uF 16V Axial | 5/$1.00 | 100 pF | 20/$1.00 |
| | | 10 uF 15V Radial | 10/$1.00 | 047 16V | 20/$1.00 |

### DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc prod. es -15 vdc @ 35ma **$1.25**

### Ceramic IF Filters

Mini [illegible] kHz
B.W. SOLD OUT [illegible] $1.50 ea.

### Trimmer Caps

Sprague - 3-40 pf
Stable Polypropylene
.50 ea.

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$.50**

### Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

### Mini RG-174 Coax

**10 ft. for $1.00**

### Coax Connector

Chassis mount BNC type **$1.00**

### 9 Volt Battery Clips

Nice quality clips **5 for $1.00**
¾" Rubber Grommets **10 for $1.00**

### Parts Bag

Asst. of chokes, disc caps, tant., resistors, transistors, diodes, MICA caps etc.
sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

### Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

### Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

### Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

### Audio Prescaler

Make high resolution audio measurments, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$29.95**
PS-2 wired **$39.95**

### 600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify -10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

### 30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$22.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay TR-1 Kit **$6.95**

### Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V ct 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

### OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 [illegible] but 500,000 MEG input z, super low 50 pa input curre[illegible] power drain.
**50 for only $9.00** SOLD OUT **10 for $2.00**

### Regulators

| | | | |
|---|---|---|---|
| 78MG | $1.25 | 7812 | $1.00 |
| 79MG | $1.25 | 7815 | $1.00 |
| 723 | $.50 | 7905 | $1.25 |
| 309K | $1.15 | 7912 | $1.25 |
| 7805 | $1.00 | 7915 | $1.25 |

### Shrink Tubing Nubs

Nice precut pces of shrink size 1" x ¼" shrink to ⅛". Great for splices. **50/$1.00**

### Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**
Opto Reflectors - Photo diode + LED **$1.00 ea.**

### Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

### CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

See List of Advertisers on page 114

# THE MOST AFFORDABLE REPEATER

## ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

***(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)***

### JUST LOOK AT THESE PRICES!

| Band | Kit | Wired/Tested |
|---|---|---|
| 10M,6M,2M,220 | $680 | $880 |
| 440 | $780 | $980 |

*Both kit and wired units are complete with all parts, modules, hardware, and crystals.*

**CALL OR WRITE FOR COMPLETE DETAILS.**

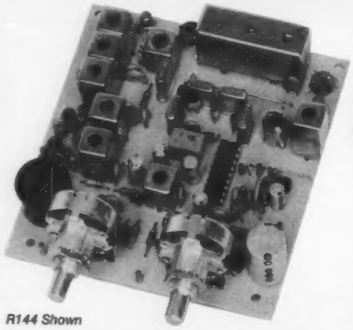
*Also available for remote site linking, crossband, and remote base.*

### FEATURES:

- SENSITIVITY SECOND TO NONE; TYPICALLY 0.15 uV ON VHF, 0.3 uV ON UHF.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE CRYSTAL FILTER & CERAMIC FILTER FOR GREATER THAN 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS. SEE R144, R220, AND R451 SPECS IN RECEIVER AD BELOW.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

## *HIGH QUALITY MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.*

### *HIGH-PERFORMANCE RECEIVER MODULES*



*R144 Shown*

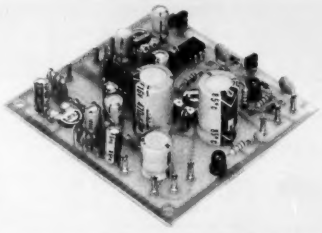
- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, more than −100 dB at ±12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft band or ham bands. Only $98.
- **R110-259 SPACE SHUTTLE RECEIVER,** kit only $98.

### *TRANSMITTERS*

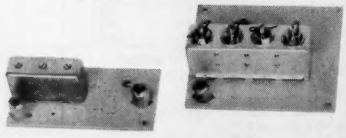
- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous, up to 2½ W intermittent. $68/kit.

- **T451 UHF FM EXCITER** 2 to 3 Watts on 450 ham band or adjacent freq. Kit only $78.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Designed especially for repeaters. $20.

### *ACCESSORIES*



- **COR KITS** With Audio mixer, speaker amplifier, tail & time out timers. Kit only $38.
- **CWID KITS** 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $68.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.



- **HELICAL RESONATOR FILTERS** available separately on pcb w/connectors.

| | |
|---|---|
| HRF-144 for 143-150 MHz | $38 |
| HRF-220 for 213-233 MHz | $38 |
| HRF-432 for 420-450 MHz | $48 |

**hamtronics®** ↩33

## NEW LOW-NOISE PREAMPS

New low-noise microwave transistors make preamps in the 0.9 to 1.0 dB noise figure range possible without the fragility and power supply problems of gas-fet's. Units furnished wired and tuned to ham band. Can be easily retuned to nearby freq.

*Models LNA( ), P30, and P432 shown*

| Model | Tunable Freq Range | Noise Figure | Gain | Price |
|---|---|---|---|---|
| LNA 28 | 20-40 | 0.9 dB | 20 dB | $39 |
| LNA 50 | 40-70 | 0.9 dB | 20 dB | $39 |
| LNA 144 | 120-180 | 1.0 dB | 18 dB | $39 |
| LNA 220 | 180-250 | 1.0 dB | 17 dB | $39 |
| LNA 432 | 380-470 | 1.0 dB | 18 dB | $45 |
| LNA 800 | 470-960 | 1.2dB | 15 dB | $45 |

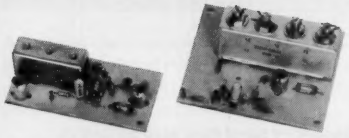
## ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
- P30W, VHF Wired/Tested $33
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

P432 also available in broadband version to cover 20-650 MHz without tuning. Same price as P432; add "B" to model #.

## HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier similar to the LNA series and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Noise figure = 1 to 1.2 dB. Gain = 12 to 15 dB.

| Model | Tuning Range | Price |
|---|---|---|
| HRA-144 | 143-150 MHz | $49 |
| HRA-220 | 213-233 MHz | $49 |
| HRA-432 | 420-450 MHz | $59 |
| HRA-( ) | 150-174MHz | $69 |
| HRA-( ) | 450-470 MHz | $79 |

## RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

| | Antenna Input Range | Receiver Output |
|---|---|---|
| VHF MODELS | 28-32 | 144-148 |
| | 50-52 | 28-30 |
| Kit with Case $49 | 50-54 | 144-148 |
| Less Case $39 | 144-146 | 28-30 |
| Wired $69 | 145-147 | 28-30 |
| | 144-144.4 | 27-27.4 |
| | 146-148 | 28-30 |
| | 144-148 | 50-54 |
| | 220-222 | 28-30 |
| | 220-224 | 144-148 |
| | 222-226 | 144-148 |
| | 220-224 | 50-54 |
| | 222-224 | 28-30 |
| UHF MODELS | 432-434 | 28-30 |
| | 435-437 | 28-30 |
| Kit with Case $59 | 432-436 | 144-148 |
| Less Case $49 | 432-436 | 50-54 |
| Wired $75 | 439.25 | 61.25 |

**SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

## SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

FM-5 PC Board Kit – **ONLY $178** complete with controls, heatsink, etc. 10 Watts, 5 Channels, for 2M or 220 MHz.

Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

REPEAT OF A SELLOUT!

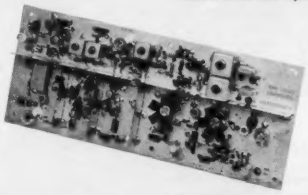
While supply lasts, get $60 cabinet kit free when you buy an FM-5 Transceiver kit. Where else can you get a complete transceiver for only $178

## TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

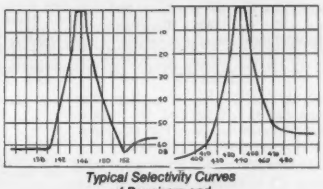
| | Exciter Input Range | Antenna Output |
|---|---|---|
| For VHF, | 28-30 | 144-146 |
| Model XV2 | 28-29 | 145-146 |
| Kit $79 | 28-30 | 50-52 |
| Wired $149 | 27-27.4 | 144-144.4 |
| (Specify band) | 28-30 | 220-222* |
| | 50-54 | 220-224 |
| | 144-146 | 50-52 |
| | 50-54 | 144-148 |
| | 144-146 | 28-30 |
| For UHF, | 28-30 | 432-434 |
| Model XV4 | 28-30 | 435-437 |
| Kit $99 | 50-54 | 432-436 |
| Wired $169 | 61.25 | 439.25 |
| | 144-148 | 432-436* |

*Add $20 for 2M input



**VHF & UHF LINEAR AMPLIFIERS.** Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

## LOOK AT THESE ATTRACTIVE CURVES!



*Typical Selectivity Curves of Receivers and Helical Resonators.*

## IMPORTANT REASONS WHY YOU SHOULD BUY FROM THE VALUE LEADER:

1. *Largest selection of vhf and uhf kits in the world.*
2. *Exceptional quality and low prices due to large volume.*
3. *Fast delivery; most kits shipped same day.*
4. *Complete, professional instruction manuals.*
5. *Prompt factory service available and free phone consultation.*
6. *In business 21 years.*
7. *Sell more repeater modules than all other mfrs. and have for years. Can give quality features for much lower cost.*

- **Call or Write for FREE CATALOG**
- (Send $1.00 or 4 IRC's for overseas mailing)
- Order by phone or mail ● Add $3 S & H per order
(Electronic answering service evenings & weekends)
Use VISA, MASTERCARD, Check, or UPS COD.

**hamtronics, inc.**
65-A MOUL RD. ● HILTON NY 14468
Phone: 716-392-9430
Hamtronics® is a registered trademark

See List of Advertisers on page 114

# DEALER DIRECTORY

### Culver City CA

**Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003.** Trades 463-1886 San Diego, 827-5732 (Reno NV).

### Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

### San Jose CA

Bay area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.**

### New Castle DE

Factory Authorized Dealer! Yaesu, ICOM, Ten-Tec, KDK, Azden, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.**

### Bloomington IL

Rohn Towers—Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, and Hy-Gain. **Hill Radio, 2503 G.E. Road, PO Box 1405, Bloomington IL 61701-0687, 663-2141.**

### Boise ID

Rocky Mountain area's newest ham dealer. Call RJM first for AEA, Azden, KDK, Ten-Tec, Butternut, Cushcraft, and more! **RJM Electronics, 4204 Overland, Boise ID 83705, 343-4018.**

### Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

### Littleton MA

The reliable ham store serving NE. Full line of ICOM & Kenwood. Yaesu HTs, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors, ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. **TEL—COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.**

### Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN, and W8RP behind the counter. **Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104, 668-8696.**

### Livonia MI

Complete photovoltaic systems. Amateur radio, repeater, satellite, and computer applications! Call Paul WD8AHO. **Encon Photovoltaics, 27600 Schoolcraft Road, Livonia MI 48150, 523-1850.**

### Hudson NH

Look!—hams, SWLs, and experimenters: parts, books, gear, antennas, towers. Call for quotes. **Polcari's ELECTRONICS CENTER, 61 Lowell Road (Route 3A), Hudson NH 03051, 883-5005.**

### Albany, New York
### UPSTATE NEW YORK

Kenwood, ICOM, Ten-Tec, Belden, Cushcraft, Larsen, Hustler, ARRL, Hy-Gain, B&W, MFJ, Mirage. New and used equipment. Serving the amateur community since 1942. **Adirondack Electronics, Inc., 1991 Central Avenue, Albany NY 12205, 456-0203** (one mile west of Northway exit 2W).

### Columbus OH

The biggest and best ham store in the Midwest featuring Kenwood and other quality products with working displays. We sell only the best. Authorized Kenwood service. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

### Stigler OK

TI99/4-4A Basic, Extended Basic, Assembly Language Programs. CW Transceive, CW Practice, DX, 1010, WAS, SSTV, Hamkid's Programs. **AC5D Computer Programs, Box 368, Stigler OK 74462, 967-2034.**

### Scranton PA

ICOM, Bird, Cushcraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W2AU/W2VS, AEA, Vibroplex, HamKey, Amphenol, Sony, B&W, Coax-Seal, Cover Craft, J.W. Miller/Daiwa, ARRL, Ameco, Shure. **LaRue Electronics, 1112 Grandview St., Scranton PA 18509, 343-2124.**

### Dallas TX

IBM PC/Apple aftermarket products: hobbyists' electronics project kits: $50.00 complete modem kit, subscription/satellite TV decoder kits, EPROM programmer/duplicator, popular memory IC testers, data sheets, application notes, and more than 6000 parts in stock. Semiconductors, discretes, video products, tools . . . Please write for your free literature/catalog. **Independent Electronics, 6415-06 Airline Rd., Dallas TX 75205.**

### Baltimore/Washington

Avantek transistors, amplifiers, oscillators, and LNAs. Coaxial cable and connectors. Blonder Tongue dealer with Microwave laboratory. **Applied Specialties, Inc., 10101G Bacon Drive, Beltsville MD 20705. Wash. 595-5393, Balt. 792-2211. 7:30 am to 6:00 pm, Monday thru Friday.**

### DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the April '84 issue must be in our hands by Feb. 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

# PROPAGATION

*J. H. Nelson*
*4 Plymouth Dr.*
*Whiting NJ 08759*

## EASTERN UNITED STATES TO:

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 7A | 7 | 7 | 3A | 3A | 3A | 3A | 3B | 7A | 14A | 21A | 21 |
| ARGENTINA | 14 | 7 | 7B | 7B | 7 | 7 | 14 | 21 | 21A | 21A | 21A | 14A |
| AUSTRALIA | 14A | 14B | 7B | 7B | 7B | 7B | 7B | 14B | 14 | 14A | 21A | 21A |
| CANAL ZONE | 7A | 7 | 7 | 7 | 7 | 7 | 7A | 14A | 21 | 21A | 21A | 14 |
| ENGLAND | 7 | 7 | 3A | 3A | 3A | 7B | 14 | 21 | 21A | 14 | 7 | 7 |
| HAWAII | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 7B | 14 | 21 | 21A | 21A |
| INDIA | 7 | 7B | 7B | 7B | 7B | 7B | 14 | 14A | 14B | 14B | 14B | 7B |
| JAPAN | 14A | 7B | 7B | 7B | 7 | 7 | 7 | 7B | 7B | 7B | 7B | 14 |
| MEXICO | 14 | 7 | 7 | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21 |
| PHILIPPINES | 14 | 7B | 7B | 7B | 7B | 7B | 7B | 14B | 14B | 14B | 14B | 14 |
| PUERTO RICO | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 | 14A |
| SOUTH AFRICA | 14 | 7 | 7 | 7 | 7B | 7A | 14A | 21 | 21A | 21A | 21 | 14 |
| U. S. S. R. | 7 | 7 | 3A | 3A | 3A | 7B | 7A | 21 | 14 | 7B | 7B | 7 |
| WEST COAST | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 |

## CENTRAL UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 7 | 7 | 3A | 3A | 3A | 3A | 3A | 7A | 14A | 21 | 21A |
| ARGENTINA | 14 | 7 | 7B | 7B | 7 | 7 | 7A | 14A | 21 | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14 | 7B | 7B | 7B | 7B | 7B | 7B | 14 | 14A | 21A | 21A |
| CANAL ZONE | 14 | 7 | 7 | 7 | 7 | 7 | 7A | 14A | 21 | 21A | 21A | 21 |
| ENGLAND | 7 | 7 | 3A | 3A | 3A | 3B | 14B | 14A | 21A | 14 | 7B | 7B |
| HAWAII | 21 | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A |
| INDIA | 14 | 7B | 7B | 7B | 7B | 7B | 7B | 14B | 14B | 14B | 14B | 7B |
| JAPAN | 14A | 14B | 7B | 7B | 7 | 7 | 7 | 7 | 7B | 7B | 14B | 14A |
| MEXICO | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 |
| PHILIPPINES | 21 | 7B | 7B | 7B | 7B | 7B | 7 | 7 | 14B | 14B | 14B | 14 |
| PUERTO RICO | 14 | 7 | 7 | 7 | 7 | 7 | 7A | 14A | 21A | 21A | 21 | 14A |
| SOUTH AFRICA | 14 | 7 | 7 | 7 | 7B | 7B | 7A | 14 | 21 | 21A | 21 | 14 |
| U. S. S. R. | 7B | 7 | 3A | 3A | 3A | 7B | 7B | 7B | 14 | 14 | 7B | 7B |

## WESTERN UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 7A | 7 | 3A | 3A | 3A | 3A | 3A | 7 | 7A | 21 | 21A |
| ARGENTINA | 21 | 14 | 7B | 7B | 7 | 7 | 7B | 14 | 21 | 21A | 21A | 21A |
| AUSTRALIA | 21A | 14A | 14 | 14 | 7B | 7B | 7B | 7B | 14 | 21 | 21A | 21A |
| CANAL ZONE | 14A | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21A |
| ENGLAND | 7B | 7 | 3A | 3A | 3A | 3B | 7B | 14B | 21A | 14 | 7B | 7B |
| HAWAII | 21A | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A |
| INDIA | 14 | 14 | 7B | 7B | 7B | 7B | 7B | 7B | 14B | 14B | 14B | 7B |
| JAPAN | 21A | 14 | 7B | 7B | 7 | 7 | 7 | 7 | 7 | 7B | 14 | 21 |
| MEXICO | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14A | 21A | 21 | 21 |
| PHILIPPINES | 21A | 14A | 14B | 7B | 7B | 7B | 7 | 7 | 7 | 14B | 14B | 21 |
| PUERTO RICO | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 |
| SOUTH AFRICA | 14 | 7 | 7 | 7 | 7B | 7B | 7B | 14 | 21 | 21A | 21 | 14 |
| U. S. S. R. | 7B | 7 | 3A | 3A | 3A | 7B | 7B | 7B | 14 | 7B | 7B | 7B |
| EAST COAST | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 |

**A = Next higher frequency band may also be useful.**
**B = Difficult circuit this period.**

**First letter = night waves. Second = day waves.**
**G = Good, F = Fair, P = Poor. * = Chance of solar flares.**
**# = Chance of aurora.**

**NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.**

## JANUARY

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| 1 F/F | 2 F/G | 3 F/G | 4 F/F | 5 F/F | 6 G/G | 7 G/G |
| 8 F/F | 9 F/G | 10 F/G | 11 F/F | 12 F/G | 13 G/G | 14 G/G |
| 15 F/F | 16 F/G | 17 G/G | 18 G/G | 19 F/F* | 20 P/F* | 21 P/F |
| 22 F/F | 23 F/G | 24 G/G | 25 G/G | 26 F/F* | 27 P/F* | 28 P/F |
| 29 F/F | 30 F/F | 31 P/F | | | | |

# YAESU FT-726R TRIBANDER

## NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

ATELLITES!! SCATTER!!

M!! EME!!

**The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!**

**Multiband Capability**

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

**Advanced Microprocessor Control**

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

**Full Duplex Option**

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

**High Performance Features**

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU
**The radio.**

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**YAESU ELECTRONICS CORPORATION** 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
**YAESU CINCINNATI SERVICE CENTER** 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

# "Comm-packed."

## BIG performance... small size... smaller price!!!

# TR-2500

**The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.**

**TR-2500 FEATURES:**

- **Extremely compact size and light weight**
  Measures 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches). Weighs 540 grams (1.2 lbs) with Ni-Cd pack.
- **LCD digital frequency readout**
  Shows frequencies and memory channels, four "Arrow" indicators.
- **Ten channel memory**
  Nine memories for simplex or ±600 kHz offset. "M0" memory for non-standard split frequency repeaters.
- **Lithium battery memory back-up**
  (Estimated 5 year life.) Maintains memory when Ni-Cd pack is fully discharged or removed.

- **HI/LOW power selection**
  2.5 watts or 300 mw.
- **Memory scan**
  Scans only channels in which frequency data is stored.
- **Programmable automatic band scan**
  Upper and lower frequency limits and scan steps of 5-kHz and larger.
- **UP/DOWN manual scan**
- **Built-in tuneable sub-tone encoder**
  Tuneable (variable resistor) to desired CTCSS tone.
- **Built-in 16-key autopatch encoder**
- **"SLIDE-LOC" battery pack**
- **Repeater reverse switch**
- **Keyboard frequency selection**
- **Extended frequency coverage**
  Covers 143.900 to 148.995 MHz in 5-kHz steps.
- **Optional power source**
  Using optional MS-1 mobile or ST-2 AC charger/power supply, radio may be operated while charging. (Automatic drop-in connections.)

Actual size

- **High impact plastic case**
- **Battery status indicator**
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

**Standard accessories include:**

- Flexible antenna with BNC connector
- 400 mAH Ni-Cd battery pack
- AC charger

**Optional accessories:**

- ST-2 Base station power supply/ charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/ power supply

# TR-3500

**70 CM FM Handheld**

- 440-449.995 MHz in 5-kHz steps
- TX OFFSET switch keyboard programmable ±5 kHz to ±9.995 MHz
- 1.5 W/300 mW HI/LOW power switch
- Auto. squelch position on squelch control
- Tone switch for TU-35B optional programmable CTCSS encoder
- Other features include 10 memories, lithium battery memory back-up, programmable automatic band scan, memory scan, UP/DOWN manual scan, repeater reverse, 16-key autopatch, keyboard frequency selection, slide-lock battery.

- VB-2530 2-M 25 W RF power amp., w/cables, mtg. brkt. (TR-2500 only)
- TU-1 Programmable CTCSS encoder (TR-2500 only)
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only)
- PB-25 Extra 400 mAH Ni-Cd battery
- PB-25H Heavy-duty 490 mAH Ni-Cd battery
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for manganese/ alkaline AA cells
- SMC-25 Speaker-microphone
- LH-2 Deluxe leather case
- BH-2A Belt hook
- RA-3 m 3/8λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap
- EP-1 Earphone

More information on the TR-2500 and TR-3500 is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

*Specifications and prices are subject to change without notice or obligatio*